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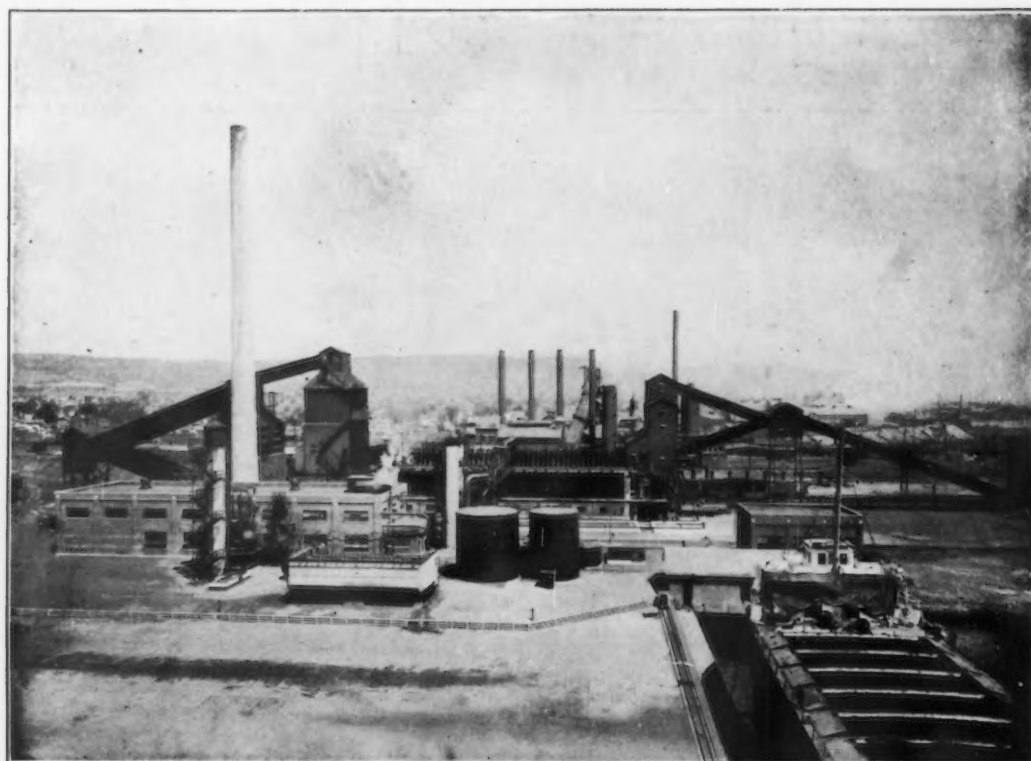
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—A. H. D., Reader Service Dept.



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239 West 39th Street
New York, N. Y.
Cable Address: "Ironage, N. Y."
F. J. FRANK, *President*
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Division of
UNITED BUSINESS PUBLISHERS, INC.
New York, N. Y.

District Offices:
CHICAGO, Otis Building
PITTSBURGH, 1319 Park Building
CLEVELAND, 1362 Hanna Building
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IRON AGE PUBLISHING CO.
Member, Audit Bureau of Circulations
Member, Associated Business Papers
Published every Thursday. Sub-
scription Price: United States and
Possessions, Mexico, Cuba, \$6.00;
Canada, \$8.50, including duty;
Foreign, \$12.00 a year. Single Copy
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<u>401</u> (pieces per month) x <u>1.55</u> (savings per piece)	
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<u>20</u> % of <u>621.55</u> (Savings per month)	<u>124.31</u>
Value of usable savings per month	<u>497.24</u>
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Net cash investment in new equipment	<u>6309.00</u>
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<u>6309.00</u> (Net cash investment)	<u>12.7</u> months
<u>497.24</u> (Usable savings per month)	
The Net Profit return per year will be:	
<u>497.24</u> (Usable savings per month) x 12 months	<u>5966.88</u>
Less 20% depreciation on <u>6309.00</u> (Net cash investment)	<u>1261.80</u>
Net Profit per year after depreciation	<u>4705.08</u>
The rate of Net Profit will be:	
<u>4705.08</u> (The Net Profit)	<u>74.6%</u>
<u>6309.00</u> (Net cash investment)	

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THE IRON AGE

NEW YORK, DECEMBER 24, 1931

ESTABLISHED 1855

VOL. 128, No. 26

THE MACHINE HAS BEEN LIBELED

By JOHN H. VAN DEVENTER

Industrial Consultant, The Iron Age

PRODUCTION men have been too busy building up the wealth of our country to cultivate facility of expression. Consequently, when they are suddenly set upon by literary phrase-mongers, cloistered professors, dilettante economists, grandiloquent politicians and "buck-passing" financiers, they are at a serious disadvantage. There is danger that in the barrage of words the truth will become obscured and progress will suffer a setback.

For this reason the author has made a special study of the relation of the machine to the present depression. In a recent address (here abstracted) before the Engineers' Club of Bridgeport, Conn., he showed that production has suffered, not because of disabilities of the machine, but rather because of the excessive growth of non-productive pursuits and the handicaps imposed by an inadequate banking system.

THE public mind, influenced by the accumulative outpourings of those who know the least about the machine and its work, is beginning to look back with longing eyes upon the "good old days" before the engineer and the inventor and the machinery builder and the manufacturer came along and worked such havoc.

The good old days, when demand always exceeded supply, because the needs were so numerous and the wherewithal to supply them so few.

The good old days of Queen Elizabeth, in which the famous statute of laborers was formulated as a measure of protection to the workers, and which set forth that:

All artificers and laborers being hired for

wages by the day or week shall, betwixt the months of March and September, be and continue at work at or before 5 o'clock in the morning, and continue at work and not depart until betwixt 7 and 8 o'clock at night.

The good old days of less than a hundred years ago, when women, in England, working 14-hr. days in the coal mines, chained to coal cars and crawling on hands and knees, dragged these loaded cars through tunnels too low to permit the use of mules.

The good old days when little children eight years old worked from sun to sun carrying sacks of coal and ore on their puny backs up long ladders.

The good old days of 80 years ago, made famous by the poet Thomas Hood, in his "Song of the Shirt," four years before the invention of the sewing



machine in 1845, before the so-called "machine age" had gotten under way.

From The "Song of the Shirt"

With fingers weary and worn,
With eyelids heavy and red,
A woman sat in unwomanly rags,
Plying her needle and thread
Stitch—stitch—stitch
In poverty, hunger and dirt;
And still, with a voice of dolorous pitch
She sang the song of the shirt.

Work, work, work,
Till the brain begins to swim
Work, work, work,
Till the eyes are heavy and dim.
Work, work, work,
My labor never lags.
And what are the wages? A bed of straw
A crust of bread, and rags.

Oh, but for one short hour,
A respite, however brief.
No blessed leisure for love or hope,
But only time for grief.
A little weeping would ease my heart,
But in their briny bed
My tears must stop, for every drop
Hinders needle and thread.

Such were the good old days before the machine age, when there was plenty of work to go around because human muscles had to do most of it; the good old days when women were cheaper for mine haulage than mules; the good old days when the child of six began those labors which were to make a worn out old man of him at 30.

I imagine that if we could give those who advocate a return of the good old days a taste of one week of them, they would be glad indeed to return to the better days of 1931, depression or no depression.

Machine Has Created, Not Destroyed, Jobs

The machine has a convincing story to present to the public, a story not based upon plausible theory, but upon forthright facts. A story that is an undeniable record of performance. The machine cannot tell you who or what did cause this depression and neither can anyone else. But it can prove beyond question that mechanization has built no breadlines. The machine can look the public in the eye and say to it: "Here is my record, attested by Uncle Sam: In 40 years of active and increasing use I have not deprived one American worker of employment; whenever I have closed one employment door I have opened another and a larger one."^{*}

Too Heavy a Non-Productive Load

The present depression is not a state of technological unemployment, for the simple reason that there is today a larger proportion of machines idle than of men. The American Federation of Labor gives

^{*}From percentage employment ratios, 10, 20, 30 and 40-year periods, all industries and other gainful employments.

the number of unemployed as 20 per cent of the normally employed workers. A canvass of unemployed machines would show at least twice that percentage.

Technological displacement will continue as long as invention and improvement continue. I am not belittling the responsibility of management in finding some way to take care of the temporarily displaced during the interval between the time that the improved machine closes one door and opens another. But, while it is a serious problem for the individual victim of it, collectively such displacement at any given time represents a very small proportion of the total of unemployed.

It should be clear from the foregoing facts that the engineer and the inventor and their products, improved machines and processes, were not the cause of the depression. What, then, did cause it? The author's belief is that it was caused by piling too heavy a non-productive load upon the back of the machine, a load constituted of overcapitalization, speculation, graft, Government interference in business, excessive taxation and a gradual increase in occupational overhead.

Cost Reduction Is the Answer

After all, what we are most interested in is not in conducting postmortems as to who was to blame for the depression, but in finding the way to bring supply and demand once more into normal balance. This resolves itself into a problem of simple division. Average annual income, divided by average cost of things bought, equals the quantity of things that can be bought. One cannot sidestep arithmetic. If, then, we make things cost more, without first increasing average income, is it not obvious that fewer things can be bought?

On the other hand, when we reduce the divisor of average cost, we increase the quotient of number of units purchasable. In other words, diminished cost to the consumer is the logical step toward turning out more goods and employing more people.

Reduction in cost of goods and increase in average consumer income are the two logical ways to increase consumption and hence to stimulate business activity. If there are any others, they do not fall into the category of mathematical reasonability.

During a period of 30 years following our Civil War, the average of commodity prices declined almost uninterruptedly. During the same period of receding prices we increased our annual output of manufactured products four times in dollar volume, eight times in actual volume, and multiplied the annual industrial wages paid by almost four. It was this performance that laid the foundations for a prosperity which could successfully stand the later terrific punishment of overcapitalization, inflation, speculation, graft, Government interference and excessive taxation and which failed to be shaken until the ultimate debacle of 1929.

How was this miracle of progress accomplished? Merely by giving heed to the



formula: Income divided by cost equals volume.

Consciously or unconsciously, our ancestors of that period chose the one effective way to apply this formula to build prosperity. They put improved machinery to work in American industry on such a scale as not merely to compensate for the declining prices but to make increasing profits out of them and to pay increased wages in spite of them. For real wages—measured in purchasing power—doubled during this period of shrinking prices. Thus the prosperity formula was worked two ways, by decreasing the divisor of cost and increasing the dividend of average purchasing power. What else could result except the ensuing multiplication of business volume and diversification.

We have in our hands the power to outwit this depression. The way to do this is to use the same method that put the panic of 1873 to flight, i.e., build prosperity in the face of a declining price trend. When prices fall, make costs go down even faster. Get the formula busy, through industrial modernization.

If this is true, why, then, are our engineers and our machinery building plants idle or on part time?



The reason lies in a stoppage in the supply line of capital and credit.

Our economic machine may be likened to an automobile. The motor is represented by our engineers, inventors and machinery builders. The carbureter is represented by capital management, and the gas tank is represented by finance.

The motor of this economic machine is capable of pulling any load and of going at any speed. It is an improved, 1932 model.

The carbureter and the gas tank are old models and inadequate for today's motor. And, in addition to this, the supply line from gas tank to motor, besides being too small for the job, is badly clogged by a sticky mass composed of fear, do-nothingness, lack of leadership and propaganda against the machine.

The rapid advance in engineering and invention has put the engineer and the machinery builder 30 years ahead of the banker and the legislator.

The solution of the difficulty is not to equip the economic car with a less efficient and less powerful motor, but to bring the other components up to date. And, most of all, to remove the congestion that is stopping up the fuel supply line.

Red Shortness of Steel in Contact with Other Metals

DEVELOPMENT of red shortness in steels (0.10 to 1 per cent carbon) at temperatures of 1500 to 2200 deg. F. as influenced by contact with other metals has been investigated by H. Schottky, K. Schichtel, and R. Stolle (*Stahl und Eisen*, June 18, 1931). Comparisons were made by hot-bend tests, the powdered contact metal being distributed over the tension side of the specimen.

Lead, bismuth, cadmium and silver produced no red shortness; they are completely insoluble in iron in the liquid and the solid state. Tin, zinc and antimony caused the steel to be red short above 1800 deg. F.; aluminum produced the same effect at 2000 deg., which is much above its melting temperature. Copper, bronze and brass embrittled the steel, beginning at temperatures about 200 deg. above their respective melting points. Cerium and silicon produced red shortness at 2200 deg., but only in high-carbon steel, so that their influence is evidently caused by ternary eutectics melting below the test temperatures.

The degree of embrittling usually increased with rising temperature, although the reverse effect was noted with zinc and aluminum. Alloys produced effects in proportion to their compositions. Bronze caused the steel to be more brittle as temperature increased, while on account of the zinc content the temperature effect of brass was in the opposite direction; increasing tin and copper content of white metal increased the shortness. Except for the

case of ternary eutectics, the carbon content of the steel was unimportant.

Some of the above results are misleading because of oxidation which prevents good metallic contact. More reliable comparisons were made by heating the pickled specimens in a salt bath, dipping them in baths of the contact metal at the same temperature and bending. Tin, antimony and aluminum produced red shortness at about 1800 deg. by this procedure, but a 35 per cent tin alloy with copper melting at 1340 deg. caused embrittlement at 1360 deg. Thus metals can cause red shortness in alpha iron. A purely ferritic alloy steel (4 per cent Si, 22 per cent Cr, 0.09 per cent C) was embrittled by antimony, confirming the effect on alpha iron, although the influences of other metals on this steel were irregular. According to this procedure high temperature favored red-shortening by all metals and alloys.

Tests on copper-coated steel showed embrittlement only above the melting point of copper. As according to the composition diagram of the Fe-Cu system no liquid is present below the melting point of copper, it seems that the red shortness is caused by contact of steel with a liquid metal. Further evidence for this view follows from the fact that bronze-coated steel, bent at temperatures within the solidification interval of bronze, exhibited shortness.

In general the metals which cause red shortness are completely miscible with iron in the liquid state, but have only a limited solubility in solid iron. However, no complete explanation as to the cause and mechanism of red shortening is proposed.

MACHINING OF STEEL IS

CONDITIONED BY

By H. H. BLEAKNEY

Ferrous Metallurgist,
Mines Branch, Department
of Mines, Canada

THE machining of steel is a subject which has engaged the attention of metallurgists since the dawn of the iron age. It has so many different aspects both mechanical and metallurgical that even today much remains to be learned. In fact, changing methods and new developments continuously bring new problems in their train.

Until comparatively recent times the attention of investigators was centered on such mechanical details as speeds, feeds, cutting angles, depth of cut and cutting oils, while the metallurgical aspects were mainly the quality of the steel in the tool and its heat treatment. But these questions have been disposed of to such an extent that today, when machining difficulties are encountered, the solution is looked for in the quality or physical condition of the steel being cut. It is a universal experience that the solution of problems which were previously considered to be the responsibility solely of the steel fabricator is being more and more placed at the door of the steel maker, and this is probably nowhere more true than in the field of the machineability of steel.

Responsibility of Steel Maker

To what extent the steel maker is responsible for the machineability of the steel which he supplies is a question which is still quite vexing and one which is probably worthy of more attention by the various steel-making and steel-treating associations. It is a

little difficult to see how the steel maker can be held responsible for machining troubles except insofar as they may be traceable to non-metallic inclusions.

It has been said, of course, that steels of different makers respond differently to heat treatment. But that has never been satisfactorily shown to be a general rule. Differences in methods of manufacture will undoubtedly cause variations in the properties of steel. But when one considers how steel melters move from plant to plant, it is likely that there is as much difference from heat to heat in one plant as there is between two different plants. In all manufacturing operations, there is a mass of opinion formed from proximate causes which does not stand the test of scientific investigation.

Non-Metallic Inclusions a Source of Trouble

As regards non-metallic inclusions, they are, beyond question, a source of trouble in machining operations, and they are a source of trouble for which the steel maker must accept the responsibility—within reason. It is probable that difficulty in machining is experienced in direct proportion to the number, size and hardness of the inclusions—other things being equal. But most of the steel used today is made in basic open-hearth furnaces, and all such steel must contain some non-metallic inclusions.

The responsibility of the steel maker cannot then extend beyond limiting the size and number of these

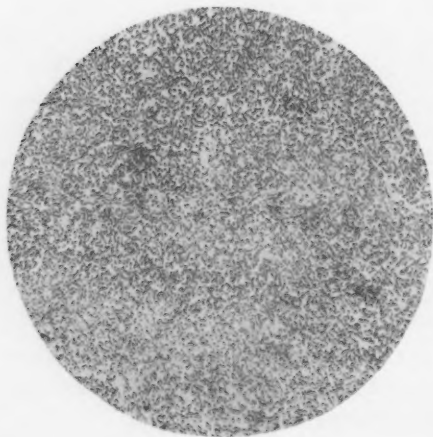


FIG. 1.—Structure of a spheroidized steel. (At left) 1000 diameters.

FIG. 2.—Structure of a pearlitic steel. (At right) 1000 diameters.





QUALITY OF METAL

inclusions to a reasonable degree, and a reasonable degree is the best that he or his competitors can consistently do and still make a fair profit. No buyer should be expected to accept dirty steel, but in the long run it is to no one's advantage to demand of the steel maker an unreasonable degree of cleanliness, such as can only be met by excessive discards.

Structural Condition of Prime Importance

In many cases, the effect of the structural condition of the steel upon machineability far outweighs the influence of inclusions, and in such cases it would seem only right that the fabricator be very sure that his structures are right before blaming his troubles upon inclusions. Such inclusions as alumina and hard silicates, if present in excessive amounts, undoubtedly dull tools and cause poor performance. But it should be remembered that manganese sulphide greatly promotes machineability. In some cases, as in the cutting of chrome steel and chrome-vanadium steel gears, a sorbitic or spheroidized structure rather than pearlitic is much more deleterious than inclusions.

As a general rule, it is found that the best machineability is encountered when both the hardness and ductility of the steel being cut are at a minimum. In other words, for a given hardness, the steel with the lowest ductility machines the most easily. Hence the great superiority of cold-drawn steel over similar steel hot rolled or annealed, and hence the vast superiority which pearlitic chrome and chrome-vanadium gear steels have over the same steels in the sorbitic or spheroidized condition.

That this difference exists is readily seen by comparing the properties of a spheroidized and pearlitic chrome-vanadium gear steel. Fig. 1 shows the struc-

NON-METALLIC inclusions are a source of trouble in machining operations for which the steel maker must accept the responsibility—within reason.

But in many cases, says the author in an article published by permission of the director of mines branch, Department of Mines, Canada, the effect of the structural condition upon machineability far outweighs the influence of inclusions. A sorbitic or spheroidized structure rather than a pearlitic one is much more deleterious than the presence of inclusions.

The best machineability is encountered when both the hardness and ductility of the steel being cut are at a minimum. Where surface is not a major consideration, low hardness is more important than ductility.

An annealed product, with a uniform lamellar pearlite, means smooth rapid operations on the machine lines with excellent tool life.

ture of the spheroidized piece, of which the properties are as follows:

Yield Point	Ultimate Stress	Elong. in 2 In.	Red. of Area	Brinell
91,600	100,350	27.7	64.2	207

Fig. 2 shows the structure of the pearlitic piece, which has the following properties:

Yield Point	Ultimate Stress	Elong. in 2 In.	Red. of Area	Brinell
51,930	101,450	20.0	38.8	207

Fig. 3 illustrates the appearance of the test pieces.

It is apparent that, for the same hardness and ultimate strength, the pearlitic steel has much less ductility than the spheroidized, and it is universally acknowledged that such steels with a pearlitic structure possess greatly superior machineability over the same steels with sorbitic or spheroidized structures. The reason for the better machining qualities of steels in a relatively brittle condition is obviously the same as that which accounts for the notoriously poor machineability of such a soft and ductile material as carbonless iron.

There are few if any fields of steel testing which present more difficulties in the collection of accurate data than that dealing with machineability. But where operations are standardized under thoroughly comparable conditions, where averages are taken over a large number of tests and where whole heats of 100 tons are compared with each other for machining

(Concluded on page 1662)



Fig. 3.—Appearance of the fractures of the two steels of Figs. 1 and 2.

METHODS USED IN CHARGING

STORAGE batteries for motive power applications, such as industrial and street trucks, tractors and locomotives, have been used extensively in recent years, and the problem of charging them in the easiest and most efficient manner has been given considerable attention by storage battery, truck and electrical manufacturers.

Two types of such batteries are in common use. These are: (1) The lead-acid battery, consisting of brown peroxide of lead for the positive plates; gray, spongy lead for the negative; and an electrolyte of sulphuric acid and water; and (2) the nickel-alkaline battery, consisting of nickel-hydrate and nickel for the positive; iron oxide for the negative; and a solution of potassium or sodium hydrate for the electrolyte.

To recharge a storage battery it is necessary to pass through the cells, in a direction opposite to that of discharge, unidirectional current of an amount equal in ampere-hours to that taken out on discharge plus an amount equal to the losses in the battery.

Storage batteries may be charged at a constant rate or the current may be tapered from a high rate at the start of the charge to a low rate at the finish. The most desirable method of charging depends upon the type of battery, although the same methods, with certain limitations, are permissible and used with both types of batteries.

Tapered Charge for Lead-Acid Batteries

Lead-acid batteries may be charged at any rate which does not produce excessive gassing or a cell temperature exceeding 110 deg. F. Based on this rule, lead-acid batteries may be given a high rate of charge at the beginning of charge, but the finishing rate is limited to a value somewhat below the normal discharge rate.

IN the charging of storage batteries for your industrial trucks, tractors or locomotives—are the most efficient methods being followed? Being extensively used, such batteries form an important maintenance item in many plants.

This article outlines the charging requirements of both the lead-acid and the nickel-alkaline battery, and discusses manual, semi-automatic and automatic methods, the last receiving particular attention. Data on motor-generator sets and on automatic control equipment for charging service are also included.

A general rule for determining the maximum permissible rate for any state of charge and at the same time come within the above limitation is: The charging rate in amperes must never exceed the ampere-hours out of the battery.

Consequently, the time for charging a fully discharged battery and the method employed may vary over very wide limits—from approximately 16 hr. or more by using a constant current at the finishing rate or less, to 5 hr. or even less by

starting at a comparatively high rate of charge and tapering off to the finishing rate.

The time for completely charging a fully discharged lead-acid battery—the type most commonly used for truck and locomotive service—is 8 hr., although this may be increased or decreased as indicated above. However, it is desirable to use all the time available in order to reduce the charging rates, thereby lowering the cell temperatures and reducing the capacity of the charging apparatus.

The voltage required at the start of charge of a fully discharged lead-acid battery is approximately 2.15 volts per cell at the terminals. As the charge progresses, the counter electromotive force of the battery increases. This requires a gradually increasing voltage up to a value depending upon the type of battery and the "finishing rate" requirements. For lead-acid batteries now in common use the finishing voltage is approximately 2.5 volts per cell at the battery terminals.

Constant Charge Preferable for Nickel-Alkaline Batteries

Nickel-alkaline batteries are preferably charged at an approximately constant current, fixed by the battery manufacturers at a value corresponding to the 5-hr. discharge rate of the battery. At this rate a fully discharged battery can be completely charged in about 7 hr. Under abnormal or emergency condi-

INDUSTRIAL STORAGE BATTERIES

By FRED. J. SCHWARZ

Industrial Engineering Department, General Electric Co., Schenectady

tions, however, this type of battery may be charged at higher rates provided there is no frothing and the temperature of the electrolyte does not exceed 115 deg. F.

A tapering current charge having an average value equal to the normal charging rate may be employed provided the rate at any point of charge does not cause frothing or excessive temperatures.

The maximum voltage required for completely charging a nickel-alkaline battery is approximately 1.85 volts per cell at the battery terminals varying between 1.8 and 1.9 volts per cell, depending on the temperature and other conditions.

There are many ways of charging storage batteries in accordance with the requirements indicated above. These may be divided into three general groups: (1) manual, (2) semi-automatic, and (3) automatic charging.

Manual charging is especially applicable when there is available a direct current supply with voltage characteristics not suited to the battery requirements, as when the available voltage is higher than the maximum required for charging the battery at the specified rates.

Assuming that the direct current voltage available is maintained practically constant, a variable resistance must be provided and periodically adjusted to obtain the proper charging rate.

Power Loss in Manual Charging

In view of the fact that the current will inherently taper due to the rise in voltage of the cells

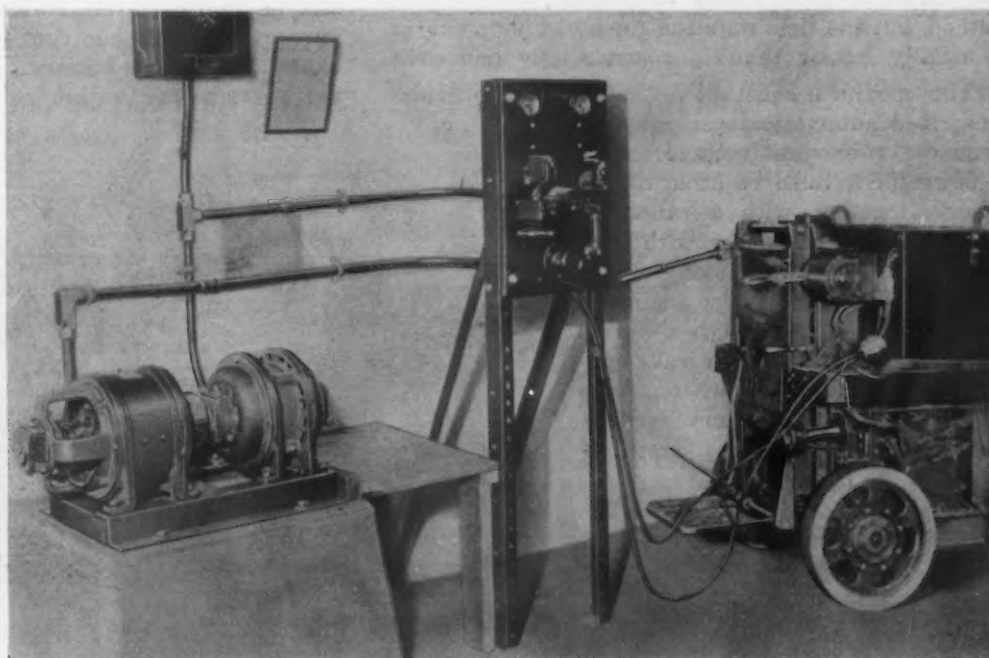
as the charge increases, the current should be set a few amperes higher at each adjustment so that the average current will be that required for this step of the charge.

The principal disadvantages of the manual or "series resistance" method of charging are the increased cost due to power loss in the series resistance, and the necessity of having an attendant available practically continuously during the charging period. The human element is also present and this may mean increased time for the charge or reduction in the life of the battery due to improper charging.

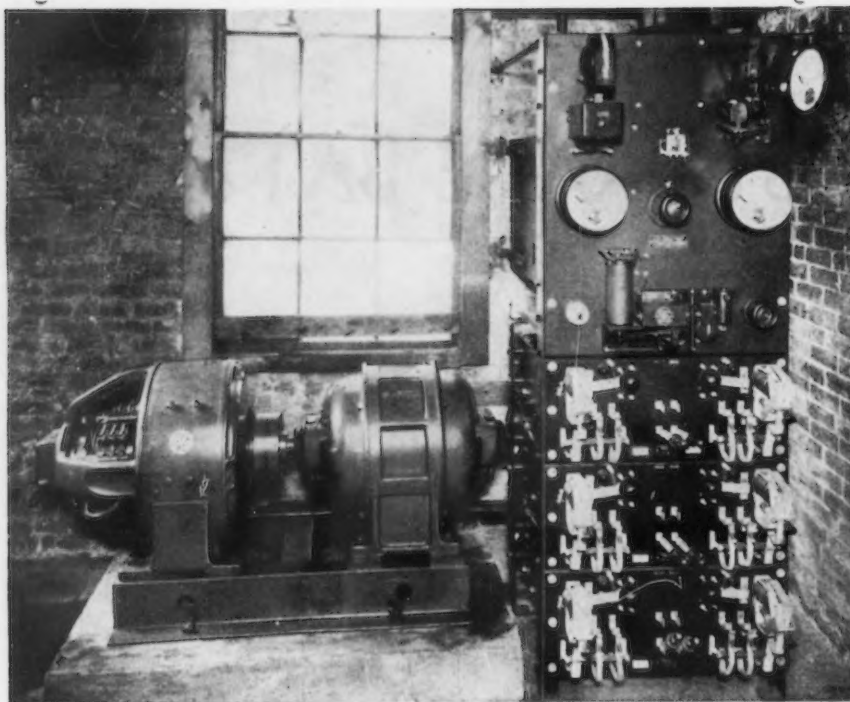
Semi-automatic charging is an intermediate group which involves either manual control of the charging rate with certain added automatic features such as automatic shutdown on completion of the charge, or automatic control with certain of the automatic features, described below, omitted.

Automatic Charging Has Important Advantages

Automatic charging is particularly desirable. It includes, primarily, automatic control of the charge-



Complete charging equipment for a single industrial truck.



This installation provides for the automatic charging of the batteries of six electric trucks.

ing rate. A completely automatic charging equipment should also embrace the following automatic features:

- Independent cut-off of each battery when fully charged.*
- Shut-down of the motor-generator set when the last battery has cut off, or, in case of failure of the power supply to the motor of the set.*
- Restart of the motor generator set upon resumption of power supply.*

The two commonly used systems for automatic charging are: Constant current, and the modified constant-potential system. The former is particularly adapted for charging nickel-alkaline batteries. The lead-acid battery may be charged also by this method, but the time required for a complete charge is usually longer than is commercially desirable.

The modified constant-voltage system provides prescribed automatic taper rates by means of a constant voltage source of power of a value required by the battery, together with a calibrated fixed resistance in series with each battery. It is well adapted for the lead-acid battery and is also applicable to the nickel-alkaline types. This method of charging is generally preferred, as it automatically regulates the current to the battery requirements regardless of the state of charge of the battery.

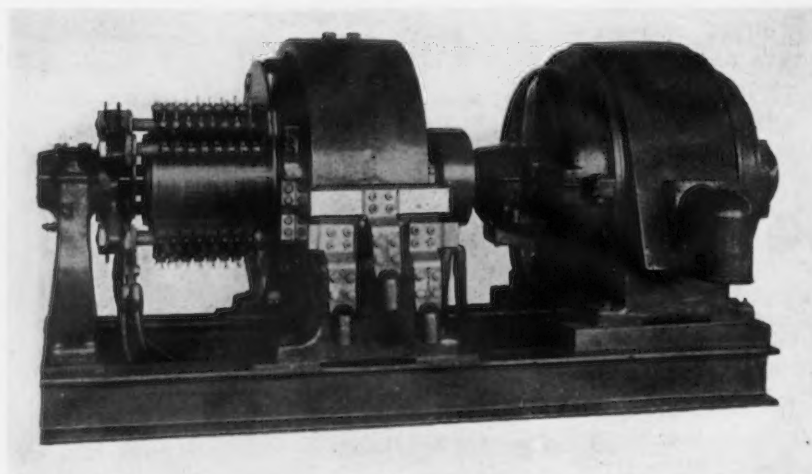
Charging by Modified Constant-Voltage Method

For successful charging by the modified constant-voltage method it is essential that the bus voltage be maintained as nearly constant as

currents obtained are given in the following table:

<i>Time of Charge, Hours</i>	<i>Bus Voltage, Per Cell</i>	<i>Starting Current per 100 Amp.-Hr. Battery Capacity</i>
5	2.53	46
6	2.56	34
7	2.59	26
8	2.63	20
9	2.685	17.5
10	2.745	15.5
12	2.975	11.5

The standard specifications also indicate that nickel-alkaline batteries may be charged by the modified constant-voltage system at a voltage as low as 1.84 volts per cell, at which the starting current will be approximately 165 per cent and the finishing current about 65 per cent of the normal 5-hr. discharge rate of the battery. A higher charging voltage, permissible within certain limits, will cause



A 1000-amp. 60-volt motor-generator set suitable for use in charging the batteries of 20 to 30 industrial trucks.

the taper to approach constant-current conditions.

In practice it has been found that with 2 volts per cell the starting current may be reduced to approximately 125 per cent of the normal 5-hr. discharge current, thereby reducing the capacity of the charging equipment without materially reducing the efficiency of charge. When only a single battery, either lead-acid or nickel-alkaline, is to be charged automat-

ically the external resistance may be omitted, provided the generator is designed to give the equivalent taper characteristics. This is termed "taper charging," or "individual battery charging."

Motor-Generator Sets Provide Proper Current

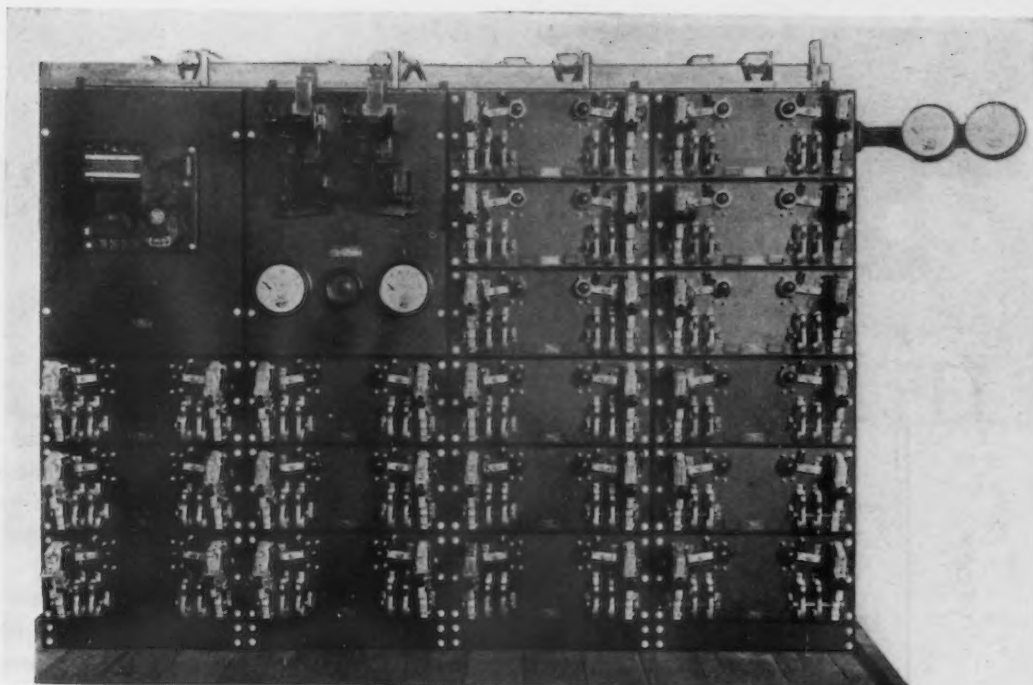
Direct current is not always available at the correct voltage for modified constant-voltage charging; moreover, in most localities alternating current only can be obtained. It becomes necessary, therefore, to convert the available power into direct current at the proper voltage. This can best be done by motor-generator sets.

The voltage of the generator of the motor-generator set is determined by the maximum voltage required at the charging bus. The maximum current rating of the generator should be the sum of the starting currents of all of the batteries which will be connected to the charging bus simultaneously. But since the current tapers off as the charge progresses, the rated current of the generator is taken as 80 per cent of the maximum current requirements.

Motor-generator sets for modified constant-voltage charging are rated on a 40 deg. C. rise basis in accordance with A. I. E. E. standards; the kilowatt capacity is obtained by multiplying the normal volts by the rated amperes and dividing the product by 1000.

The generators are usually of compound-wound type, and if a voltage regulator is not used they must be designed so that the terminal voltage shall at no time be more than 3 per cent above or below the specified value. A voltage regulator, however, permits use of a generator of normal design and will usually maintain closer voltage regulation than where it is obtained inherently in the generator.

The driving motor of the motor-generator set may be of any standard type provided the speed



Control panel for generator and 36 battery-charging circuits

regulation is sufficiently close to permit the generator regulation specified. The capacity of the motor should be such that it will be capable of driving the generator continuously at its rated capacity with a temperature rise not exceeding 40 deg. C.

Automatic Control Equipment Required

For modified constant-potential charging of two or more batteries the control and meter equipment for the generator of the motor-generator set should include:

Overload protection for the generator.

Reverse current protection in case of failure of power to the motor.

Provision for opening both sides of the generator circuit. Means for shutting down the motor-generator set when the last battery cuts off.

Field rheostat for adjustment of the generator voltage if regulator is not used.

Voltage regulator for maintaining generator voltage within the prescribed limits if the generator is not designed for close regulation.

Instruments for indicating total ampere load on the generator, operating voltage of the generator, current in any charging circuit and voltage on any charging circuit.

Each charging circuit should be provided with a cut-off circuit breaker of a type which is held closed magnetically and whose energizing coil is in the circuit of the contacts in the ampere-hour meter, and necessary interlocks on the cut-off circuit breaker for shutting down the motor-generator set when the last battery cuts off. Also, means for reading volts and amperes in the charging circuit, and for opening both sides of the battery circuit; overload protection in one or both sides of the circuit; and a charging resistor.

The automatic cut-off for each battery is obtained from an ampere-hour meter (preferably mounted on

(Concluded on page 1662)

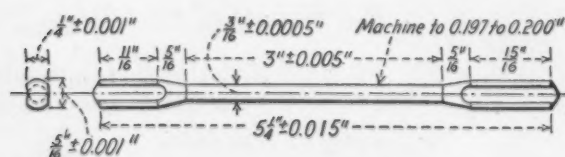
MEASURING THE STRENGTH,

IN a study of the fundamental properties which can affect the usefulness of tool steels, it early became evident that a knowledge of strength and toughness would be of great value. A method of measuring the strength and plasticity in hardened steels by the torsion test was developed. From the results obtained a value known as a coefficient of toughness is calculated.

Properties of a typical tool steel over a wide range of heat treatments were studied by this method. The author correlates the several properties and points out their bearing on an existing theory of hardness. The steel was found very responsive to variations in heat treatment. By suitable changes in the hardening and drawing temperatures it is possible to secure many interesting combinations of properties.

A METHOD of torsion testing for determining the strength, plasticity and toughness in hardened tool steels was described by J. V. Emmons, metallurgist, Cleveland Twist Drill Co., Cleveland, at the annual meeting of the American Society for Testing Materials in Chicago. It appears possible that the use of this method may be extended to include other materials which are so brittle as to make determinations of plasticity or toughness difficult. Although these tests may not be expected to determine the commercial value of a steel, still they do afford a general knowledge of response of the mechanical properties of hardened tool steel to variations in heat treatment and are therefore of value before attempting to utilize a given steel for a definite purpose.

Total deformation may be divided into the elastic deformation which is proportional to the stress and the plastic deformation which occurs only at stresses beyond the proportional limit. Values for the plastic deformation were obtained in the following manner (referring to Fig. 2): A typical stress-strain curve was plotted, usually from the group of test specimens that showed the highest ultimate torque. The straight portion of the curve was then projected to the top of the chart. This straight line was regarded as representing the elastic deformation of the specimen. The value for the plastic deformation was then the total deformation at the ultimate torque minus the elastic deformation.



In the figure, the distance AC represents the total deformation, AB the elastic deformation and BC the plastic deformation. From the ratio of the elastic deformation to the torque may be calculated the torsional modulus of elasticity or, as it is sometimes called, the modulus of rigidity.

Plastic deformation is one of the fundamental properties of the steel which has a large effect upon the toughness and is sometimes confused with it. As has been pointed out by Jeffries and Archer, a

Fig. 2. — Typical stress-strain curve showing scatter of determinations and method of obtaining the plastic deformation.

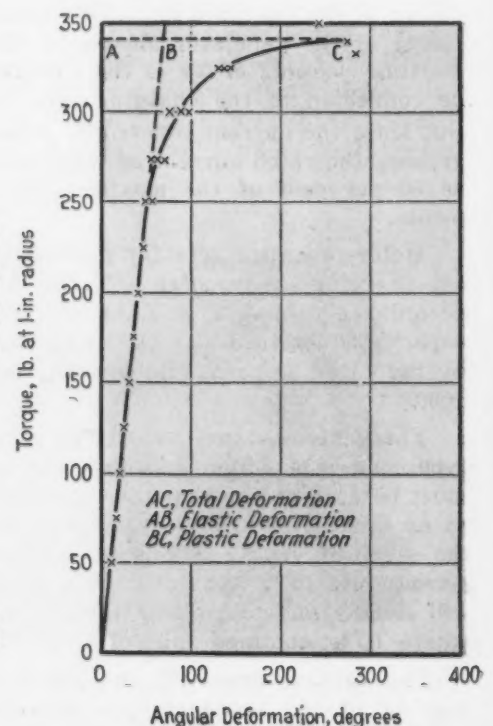


Fig. 1. — Torsion test specimen (at left)

PLASTICITY AND

TOUGHNESS OF TOOL STEELS

By J. V. EMMONS

Metallurgist, Cleveland Twist
Drill Co., Cleveland

true conception of the property of toughness involves the idea of strength as well as that of deformation.

Any attempt to evaluate toughness numerically involves combining strength with deformation in some proportion. Both elastic and plastic deformation without doubt contribute to toughness, so that the total deformation must be used. For the particular test specimen, Fig. 1, and method used, it was found that the product of the ultimate torque in pounds at 1-in. radius and the total angular deformation in degrees combined the strength and deformation in about equal proportions for the case of very strong and tough steels. A number so obtained was believed to give at least a rough approximation of the toughness and has been termed a "coefficient of toughness."

How the Method Is Applied

This testing method was applied to a chromium tool steel of the following analysis:

	Per Cent
Carbon	1.12
Manganese	0.19
Phosphorus	0.014
Silicon	0.30
Sulphur	0.007
Chromium	1.07

It was particularly desired to investigate the mechanical properties of this steel as developed by various hardening and drawing temperatures. It has previously* been shown by the author that the method of distribution of the cementite has a large effect upon the properties of tool steel. In order to reduce the effect of such variations in the initial distribution to a minimum, great care was exercised to secure a coil of wire with very uniform structure. For purposes of comparison with the strength, the plasticity and the toughness as determined by the torsion test, the hardness was also determined by the Rockwell method.

Special Schedule of Heat Treatments

A schedule of heat treatments was prepared to cover a large range of both hardening and drawing temperatures, including temperatures both below and above those commonly regarded as useful. All hardening was done from a lead bath. The quenching bath was oil. The soaking time at the hardening temperature was 60 sec. The soaking time at the

*"Structure and Heat Treatment of Tool Steel," *Iron Trade Review*, Vol. 50, page 450, 1912.

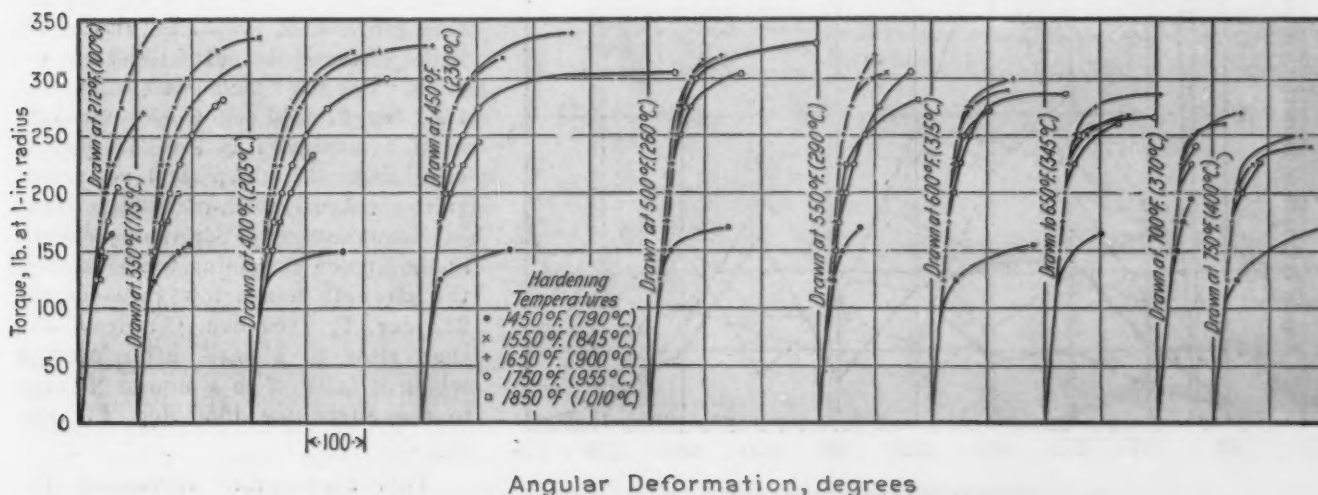


Fig. 3—Stress-strain curves for specimens drawn at various temperatures.

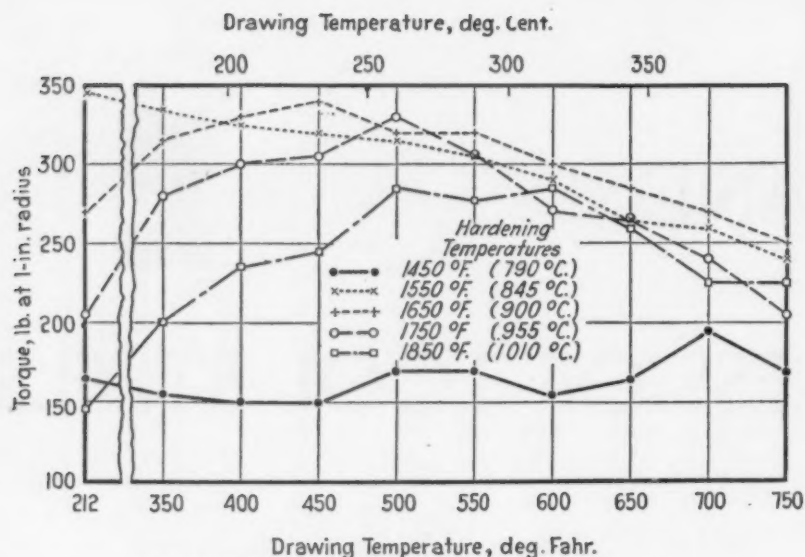


Fig. 4.—Ultimate torque at varying drawing temperatures.

drawing temperature was 30 min. Each heat treatment was run in triplicate, requiring for the 50 variations 150 test specimens, which were all from one coil of wire rod. Stress strain curves were plotted, as shown in Fig. 3.

Preliminary consideration of these curves indicates that the variations in heat treatment have developed pronounced differences in physical properties. Both the ultimate torque and the total deformation show changes through a wide range of values and appear to have responded systematically to the variations in heat treatment. Further analysis of the observations is made by plotting the values for ultimate torque against drawing temperatures, as shown in Fig. 4; also the values for plastic deformation against drawing temperatures, as shown in Fig. 5. The coefficients of toughness were plotted against variable drawing temperatures in Fig. 6.

In order to throw as much light as possible upon

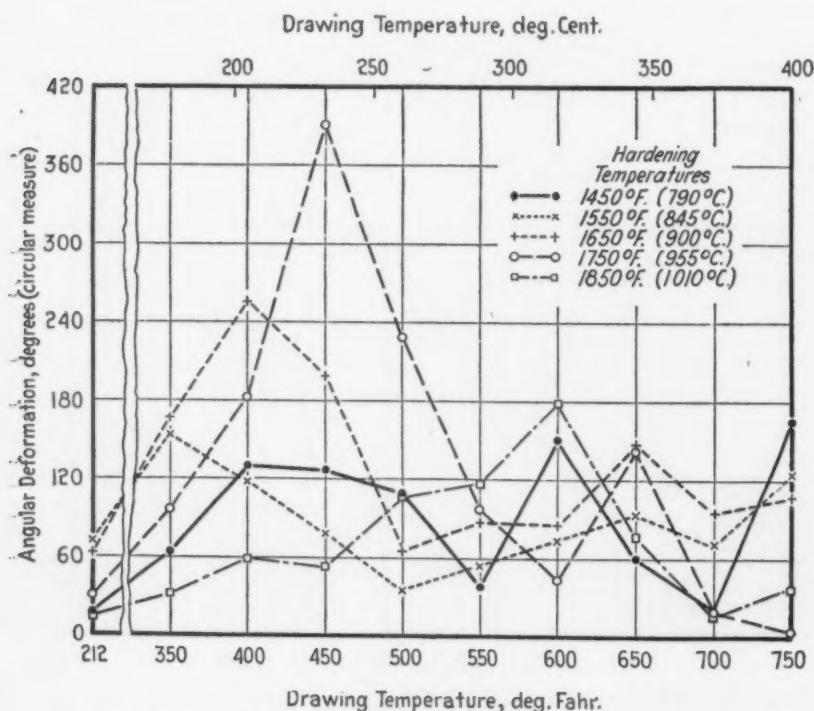


Fig. 5.—Plastic deformation at varying drawing temperatures.

the properties of the steel under consideration, determinations were also made of the Rockwell hardness using the diamond cone and the "C" scale. Curves were plotted for Rockwell hardness against drawing temperatures as given in Fig. 7. In order to show more clearly the effect of the variations of the heat treatment upon the hardness, curves were also plotted for Rockwell hardness against hardening temperatures, as shown in Fig. 8.

Properties of the Steel Analyzed

Considering the stress-strain curves in Fig. 3, it is obvious that the variations in heat treatment have greatly affected the strength, the elastic and plastic deformation. The plastic deformation begins almost imperceptibly with no definite yield point. The proportional limit is so difficult to locate precisely in torsion that the attempt was not made in this experiment.

The modulus of elasticity in torsion was calculated to be 9,400,000 lb. per sq. in. In these calculations, suitable corrections were introduced for the elastic deformation of the tapered ends of the specimens. As the test specimen here used is not designed for the purpose of determining the modulus of elasticity, no particular accuracy is claimed for this value. This modulus did not appear to have been affected by the variations in heat treatment used in this experiment.

The maximum strength observed was in the specimens hardened at 1550 deg. F. (845 deg. C.) and drawn at 212 deg. F. (100 deg. C.). As these specimens showed low plastic deformation, a calculation of the ultimate torsional strength in the extreme fibers would be nearly correct. The value obtained was 268,000 lb. per sq. in.

The ultimate torque, as shown in Fig. 4, is greatly affected by variations in the drawing temperatures. Each hardening temperature also produces a curve which has its own individuality. For the specimens hardened at 1450 deg. F. (790 deg. C.) the strength is of a low order and is but little changed by variations in the draw. For the specimens hardened at 1550 deg. F. (845 deg. C.) the strength is at a maximum at the 212 deg. F. (100 deg. C.) draw and decreases quite constantly with increasing drawing temperatures. For the specimens at the higher hardening temperatures, the strength has a low value at the 212 deg. F. (100 deg. C.) draw and then rises to a peak, after passing which it falls off in a similar manner to the curve for 1550 deg. F. (845 deg. C.).

This shows that increasing the hardening temperature increases the

drawing temperature at which the peak of strength occurs. For drawing temperatures above 350 deg. F. (175 deg. C.), the hardening temperature of 1650 deg. F. (900 deg. C.) appears to produce the highest average strength.

The plastic deformation, as shown in Fig. 5, likewise displays a characteristic curve in which the values start low at 212 deg. F. (100 deg. C.), rise to a peak at low drawing temperatures, drop violently to low points between the draws of 500 deg. F. (260 deg. C.) and 700 deg. F. (370 deg. C.), then start an irregular recovery.

The height of some of the peaks is startling. The valleys follow the peaks at draws averaging 125 deg. F. (70 deg. C.) higher. These valleys bear a startling resemblance to so-called "blue brittleness." The drawing temperatures used were not sufficiently high to give much of a picture of the plastic recovery as the annealing range is approached.

Curves plotted for the coefficient of toughness in Fig. 6, being a combination of the results for the ultimate torque and the plastic deformation, show a similar shape. The highest value for toughness is at the hardening temperature of 1750 deg. F. (955 deg. C.) with a draw of 450 deg. F. (230 deg. C.). The peaks are in all cases sharp ones, indicating the necessity of accurate heat treatment if the maximum toughness is sought. The drop in toughness after the peak is passed is sharp and positive. It is obvious that the toughness of this steel is a long way from being proportional to the drawing temperature, as is sometimes assumed to be the case with hardened tools in general.

The curves plotted for the Rockwell hardness in Fig. 7 show in general a regular decrease in hardness with increasing drawing temperatures. There are two exceptions to this in the case of the specimens hardened at 1750 deg. F. (945 deg. C.) and 1850 deg. F. (1010 deg. C.). These specimens show a higher hardness at the 350 deg. F. (175 deg. C.) draw than at 212 deg. F. (100 deg. C.). In Fig. 8, the lower drawing temperatures are seen to have a peak hardness at a hardening temperature of 1650 deg. F. (900 deg. C.), while the higher drawing temperatures reach their hardness peak at 1750 deg. F. (955 deg. C.).

In comparing the curves for the several properties with each other it is observed that the curves for ultimate torque, plastic deformation and Rockwell hardness have each their own characteristics which bear little relation to each other, except in occasional

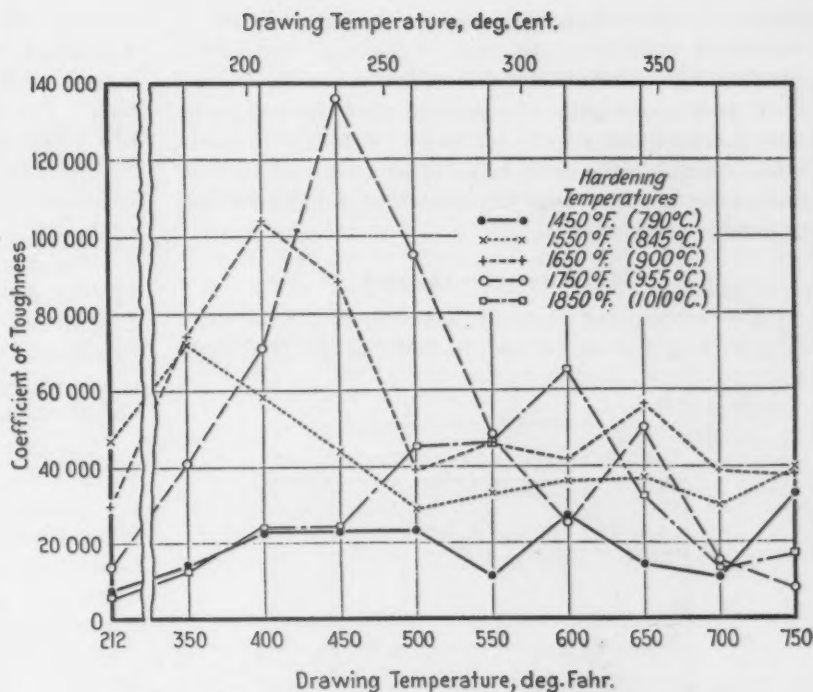


Fig. 6.—Coefficient of toughness at varying drawing temperatures.

instances. Two of the interesting exceptions are as follows:

First, for specimens hardened at 1850 deg. F. (1010 deg. C.), the curves for ultimate torque and plastic deformation are very similar in shape, both rising from low values to a peak at a draw of 600 deg. F. (315 deg. C.) then falling off again. This coincidence gives the specimens hardened at 1850 deg. F. (1010 deg. C.) and drawn at 600 deg. F. (315 deg. C.) a noteworthy degree of toughness for such a high hardening temperature.

Second, for specimens hardened at 1550 deg. F. (845 deg. C.) the curves for ultimate torque and hardness are very similar, both showing a regular decrease in value for increasing drawing temperatures. For the higher hardening temperatures 1650 deg. F. (900 deg. C.), 1750 deg. F. (955 deg. C.), and 1850 deg. F. (1010

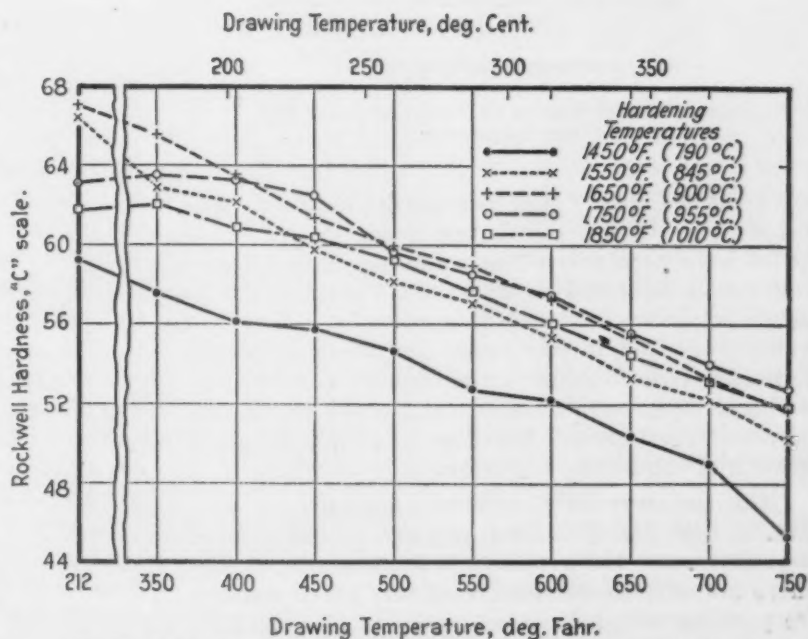


Fig. 7.—Rockwell hardness ("C" scale) at varying drawing temperatures.

deg. C.), the strength and hardness are inversely proportional until after the peak of strength has been passed, when they become proportional.

It is a noteworthy observation that the hardness and the toughness bear no simple relation to each other, particularly as it is so often assumed in tool hardening practice that hardness and toughness are inversely proportional.

Microstructure Analyzed

The structure of a specimen hardened at 1450 deg. F. (790 deg. C.) and drawn at 212 deg. F. (100 deg.

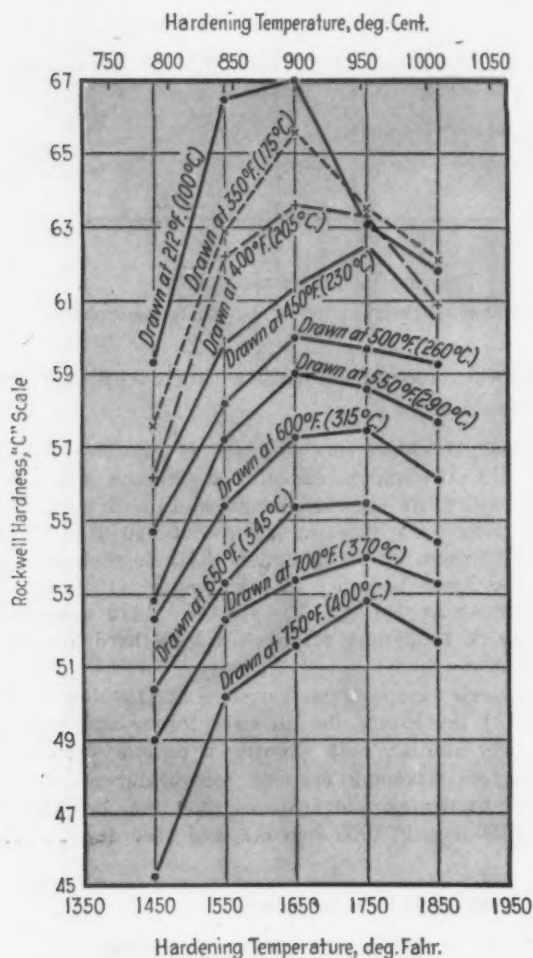


Fig. 8.—Rockwell hardness ("C" scale) at varying hardening temperatures.

C.) indicates clearly that only partial hardening has taken place. Comparatively few of the cementite particles have been taken into solution. It is surprising that a Rockwell hardness ("C" scale) as high as 59 was obtained with this structure. The low values for strength and plastic deformation are attributed partly to the presence of large quantities of undissolved massive cementite and partly to the lack of precipitated carbide particles to inhibit the grain growth of the ferrite in the troostite matrix.

The structure of a specimen hardened at 1550 deg. F. (845 deg. C.) and drawn at 212 deg. F. (100 deg. C.) shows the specimen is fully hardened, but there are still large numbers of very small cementite particles which have not yet gone into solution. Occasional large particles of cementite are scattered

through the structure. This specimen has the maximum strength observed in this experiment, together with high hardness but low plastic deformation. The high value for strength is attributed to the large proportion of martensite present and to its extremely fine crystallization. The low plastic deformation appears to be an inherent property of such finely crystallized martensite.

The structure of a specimen hardened at 1650 deg. F. (900 deg. C.) and drawn at 212 deg. F. (100 deg. C.) shows cementite particles have been largely taken into solution, although many small ones and a few massive particles still persist. The plastic deformation is practically unchanged.

The structure of a specimen hardened at 1750 deg. F. (955 deg. C.) and drawn at 212 deg. F. (100 deg. C.) shows the beginning of a definite austenitic crystallization. The small cementite particles are nearly all in solution, although a few massive particles still persist. The specimen hardened at this temperature is the first to show diffusion and recrystallization upon a scale large enough to be observed by the microscope. This beginning of austenitic recrystallization has been accompanied by definite drops in the strength, the plastic deformation and the hardness.

The structure of a specimen hardened at 1850 deg. F. (1010 deg. C.) and drawn at 212 deg. F. (100 deg. C.) is predominantly austenitic in appearance. Free cementite has almost completely disappeared, and only in rare cases can a few massive particles be found. The hardness has dropped to Rockwell 61.9 ("C" scale), while the strength is the lowest observed in the entire experiment and the plastic deformation is almost at the vanishing point.

The structure of a specimen hardened at 1450 deg. F. (790 deg. C.) and drawn at 750 deg. F. (400 deg. C.) shows the martensite is converted to troostite, but the cementite particles are still largely in the massive form in which they were observed in the annealed structure. The plastic deformation has increased slightly while the hardness has greatly decreased.

The structure of the specimen hardened at 1650 deg. F. (900 deg. C.) and drawn at 450 deg. F. (230 deg. C.) shows the martensite has been partially converted to troostite. This structure is noteworthy as having produced the highest strength observed after any considerable amount of drawing. The plastic deformation is high but is materially below the peak for this hardening temperature which occurred at the 400 deg. F. (205 deg. C.) draw. The hardness has fallen to 61.4, Rockwell "C" scale.

The structure of the specimen hardened at 1850 deg. F. (1010 deg. C.) and drawn at 500 deg. F. (260 deg. C.) shows the austenite largely but not entirely converted to martensite. While some conversion of the martensite to troostite has doubtless taken place, the martensite appears to be quite resistant to drawing. The strength is at the peak for this hardening temperature. This peak is here broad, extending from draw 500 deg. F. (260 deg. C.) to draw 600 deg. F. (315 deg. C.).

At the 600 deg. F. (315 deg. C.) draw, the austen-

ite has been entirely converted to martensite while the troostite is more prominent. Here is the only case where the peaks for strength and plastic deformation coincide. This coincidence may be explained by the great heterogeneity of the structure. This coincidence of the peaks produces at this point a toughness which is unexpectedly great in view of the coarse crystallization. The hardness is about the average for this drawing temperature, being 56.1, Rockwell "C" scale.

Structure of a specimen hardened at 1850 deg. F. (1010 deg. C.) and drawn at 750 deg. F. (400 deg. C.) shows the austenite and martensite have now practically disappeared, but the outlines of the former austenite grains are still vaguely marked by the cementite particles which have been precipitated from them. The extent to which the carbon has been

concentrated in the large austenite flakes is now apparent. This structure is characterized by low hardness, low strength and low plasticity.

In this investigation the steel tested was found quite responsive to variations in heat treatment. It is possible by suitable changes in the hardening and drawing temperatures to secure many interesting combinations of properties. These different sets of properties in turn may be expected to fit the steel for many fields of usefulness. The flexibility of application has without doubt greatly assisted in promoting the commercial popularity of this steel. The numerical data here recorded will be of assistance in the future utilization of this steel and also serve to form a basis for comparing the properties of new and untried steels with a steel of well proved usefulness.

▲ ▲ ▲

Metal Best for Walls of Buildings

By M. B. BOWMAN

Bowman Brothers, Inc., architects, Chicago

THE fact that metal is being used more extensively in building and other construction is not a good reason for its use in metal wall construction, but the fact that metal serves the purpose better than any other material we know of at present is definitely a good reason for its use in walls. It does the job better because of the great strength obtainable in a small thickness, because it can be easily shaped by machine, and because of the weathering qualities of such materials as aluminum, rustless steels and copper.

The exterior walls of a building are primarily for shelter or insulation, and should be designed to resist wind loads only. This permits us to reduce our curtain wall to approximately 3 in. in thickness. The insulation of the wall may be of cork, rock wool or various other accepted materials and the interior finish may be applied in the factory directly to the insulation on the inside of the slab. An interior wall finish such as linoleum can be used, thus eliminating the necessity for plastering on the job, an expensive operation.

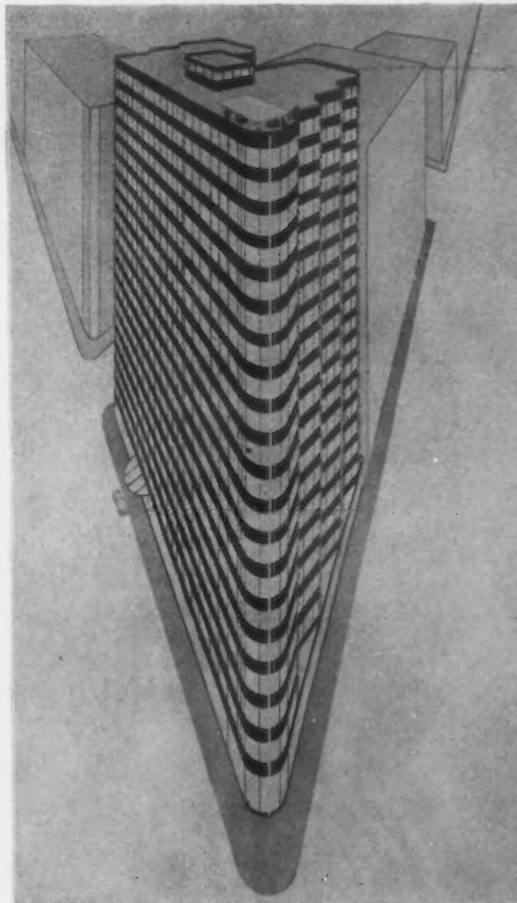
A 3-in. wall built up of

the above mentioned materials will have about one-tenth the weight of a masonry wall and about three times the insulation value, besides giving additional floor space to the building. The units may be shop fabricated and erected quickly on the job, thus saving a great deal of labor.

Aluminum has the advantage of being easily worked and light in weight. As it can be extruded it lends itself readily to use in a special double-glazed window which we have developed for the thin-wall construction. Its softness allows it to be easily stamped into units for the wall construction.

At present, metal is being used on buildings as ornamental treatment and in many cases not to its best advantage. Materials should be chosen for the work they do best rather than for effect. The use of metal for spandrels was a step in the right direction as it gave more floor space at the windows, lightened the weight of the building and tended to speed up erection.

At present we have on our boards plans for six all-metal building projects which are slated for construction in 1932.



A 20-story, metal-walled building, designed by Bowman Brothers, Inc., Chicago, and scheduled for construction early next year.

WELDED STRUCTURES, CASTINGS



INTER-INDUSTRY competition has become a dominant feature of our economic life. Consumers of engineering materials are being offered an ever-widening array of products from which to choose. Suppliers of materials are being confronted with rapidly changing requirements of users and steady advances in the manufacture of alternative products. Selection of materials should be based on merits, in the view of Major R. A. Bull, and the individual producer should not attempt to retain a given class of business unless his material is superior to others in utility and ultimate cost. In an address before the National Founders' Association at New York, Nov. 19, Major Bull critically reviewed the characteristics of the various classes of castings, of forgings and of welded structures. His paper, here abstracted, should be of interest to all users and producers of engineering materials.

FOUNDRYMEN, now more than at any time in the past, should try to take an unprejudiced view of the inherent adaptabilities of metals, and endeavor to determine suitability from the standpoint of consumers' interests. This means gaging the utility and ultimate cost of welded structures and of other metal parts that may be offered in competition.

If, for example, it seems clear that the choice of any portion of a piece of equipment which is or might be made detachable, will result more satisfactorily as to durability or total cost, or both, when the part is constructed of material not made by the interested foundryman, he then should not try vigorously to hold permanently that kind of business; unless there is reason for belief that progress in his foundry will result in lower cost or better suitability of the casting. To some that may seem impracticable, considered in relation to sales volume objectives. But the principle is sound economically when broadly applied.

There are what might be termed "twilight zones" of application where it is hard to ascertain the better suitability of steel forgings as compared with steel castings; of cast steel as compared with malleable iron; of malleable iron as compared with gray iron; of welded structures as compared with parts formed integrally. The greater attention now being given to maintenance costs by users of equipment is gradually reducing the number of applications which have apparently occupied an intermediate position.

Characteristics of Different Foundry Metals

FORTUNATELY, the general characteristics of each foundry metal are pretty well understood; so that informed foundrymen are not apt to go very far wrong in making deduc-

tions based on properties in the present and prospective products of competitive branches of the casting industry. For example, it is generally recognized that gray iron, purely because of its inherent composition, is not distinguished by ductility to an appreciable extent; but that it is admirably suited for many industrial uses where toughness (a composite property combining strength and ductility) is not needed. Gray iron exerts significant resistance to compressive forces; to many kinds of surface wear; to tension when unaccompanied by various other stresses; to internal pressures unassociated with impacts; and to many other industrial applications unnecessary to enumerate.

The extent to which gray iron is adapted to many purposes as the result of employing special compositions and heat treatments has been demonstrated in the last few years much more than ever before. It is to the credit of makers of alloys that they have made significant contributions to all metal industries, in developing and scientifically studying the effects of new materials on the behavior of equipment components. In this connection, it is worth noting that tensile strengths in gray iron vary, accord-

ing to the requirements, from around 20,000 to upward of 100,000 lb. per sq. in.

The malleable casting has a competitive field lying between that properly occupied by gray iron and that for which steel is unquestionably adapted. It is unnecessary to go into detail regarding the combination of what may be termed appreciable strength and moderate ductility, typical of the malleable iron casting, except to mention that these characteristics are somewhat expandible. Tensile strengths may run from 35,000 to 70,000 lb. per sq. in., and percentages of elongation from 5 to 30 per cent.

It would be inappropriate on this occasion for me to enlarge on the versatility of the steel casting, meaning by that, its very extensive range of physical properties. Because of the widely diversified chemical compositions possible to employ, the product of the steel foundry happens to be peculiarly free from many limitations that restrict the economical adaptation of other ferrous castings.

On the face of it, the comment just made might be regarded as a claim for the ability of the steel casting to meet practically any requirement for great resistance to stresses and wear, either or both. An explanation may prevent the thought that far-sighted steel foundrymen are disposed to introduce their material wherever the cast steel part could perform the duty required. Laws of economics must eventually govern the selection of all industrial materials. And the nature of existing foundry practices is such that the costs of production of gray iron, malleable iron and cast steel increase in the progressive order indicated, for each of many types of castings. We should realize that it is wasteful to apply a steel casting where the stresses calling for ductility are not excessive for the malleable casting, or where the conditions of service lend themselves nicely to the comparatively brittle condition of the gray iron product; in each case, keeping in mind the ability of the material to show adequate strength and other properties, in cross-sections within desirable weight limitations.

Characteristics of Welded Structures

OBVIOUSLY, it becomes necessary for foundrymen to study the characteristics resulting from the



AND FORGINGS COMPARED



welding operation. In such investigations we observe that weld-metal differs from any other kind of material made in the foundry, the mill or the forging shop; and we perceive that the properties in a welded structure should be considered from several standpoints.

Deposition of metal by the aid of the gas torch or the electric arc, except when equipment of very unusual nature is employed for preventing atmospheric contact, results in the partial oxidation of those elements in metal which burn out at the high temperature developed. Thus far, the cleverest welding experts have been unable satisfactorily to introduce into such metal compensating percentages of those useful elements that have become lowered in proportion as the result of the fusing temperature. This oxidation inevitably creates some slag, which may or may not be augmented by coatings frequently applied to welding rods. These coatings, when melted, are intended to serve as a liquid blanket, restricting oxidation.

The combination of oxygen with certain elements always present in ferrous metal creates gas. It is extremely difficult to exclude all the gas and all the slag from weld-metal. Very often, when deposits of appreciable depth are made (advisedly in many cases) in layers, the new material is found, on examination in the laboratory, to consist of strata of metal containing very small gas cavities, films of slag forming the boundaries of each stratum. The composite mass may sometimes be observed as a series of unsymmetrical laminations.

What has been said, indicative of inferiority, should not induce any foundryman to undervalue the highly intelligent efforts constantly made by welding engineers to improve metal in fused joints. Much progress has been made in these directions, and further important advancement will be made. The speaker's comments regarding the characteristics of welded structures relate to average conditions as they have prevailed up to this time. Arc welding done under a protecting envelope of hydrogen gas practically prevents oxidation and constitutes an effective, relatively expensive, welding method which is rarely employed.

Danger of Cooling Strains

The sudden chilling of a small mass of liquid metal, which inevitably results from exposure to the at-

mosphere, creates cooling strains of the same general nature as are found in many steel castings of unequal sections before annealing. These strains may be very injurious. Steel is peculiarly susceptible to temperature for changing its granular and other physical characteristics. When two pieces of wrought steel are formed into one structure by fusion, the portions of the original pieces closely adjacent to the welding zone are influenced by temperatures sufficient to affect granular structure, and, consequently, physical behavior, except as the condition may be remedied by subsequent heat treatment. The extent to which injury occurs from this cause depends partially on the chemical composition of the metal subjected to radiated heat. Certain grades of steel are much more affected than others when suddenly made red hot, then quickly chilled.

All of this means that where high stresses are to be exerted in service on important welded structures the user should determine the representative properties in the deposited weld-metal; in the joint between the weld-metal and the parent metal; and in those portions of the base metal closely adjacent to the welding zone which were made hot enough to affect granular structure.

The consumer should go further. Having determined what the average properties are in each of the three portions of the area deposited or affected by welding, he should ascertain as nearly as he can the nature, degree and direction of the stresses to be exerted on the part after it goes into service.

Cost and Appearance Are Factors

If finally it is believed that each one of the contemplated welded structures of a given kind would have adequate strength, ductility, shock resistance and other stress resisting requisites for the application contemplated, there remain to be decided questions of cost and appearance. This is where many iron foundrymen come prominently into the competitive picture, likewise not a few steel foundrymen; although, because of the recognized characteristics of cast steel, those who make it are less subject to disturbing competition by "weldings" than are their colleagues in the iron foundry.

It needs only to be mentioned briefly that the foundryman who competes

with the welder should determine his sales policy, not only from the standpoint of the factors mentioned, but by estimates governed by the number of pieces required and the expense of pattern equipment. The weight of the part is another important element affecting the foundryman in many instances. The time consumed for making one or a few of the units needed presents a detail that may definitely influence the purchaser.

Characteristics of Forgings

NOT a few foundrymen are confronted with competition from forgings. During the last 10 years manufacturers of that material have effected considerable reductions of cost, accompanied occasionally by improved physical properties. Probably the most important benefit gained by the buyer has been lowered machining expense, due to reduction in waste metal.

The forging is characterized ordinarily by resistance that is affected to considerable extent by the direction of flow under forging pressure. A test specimen taken from a forging at a right angle to the line of compression often shows inferiority in physical properties ascertained in the laboratory, as compared with a specimen cut longitudinally. A test piece removed at a tangent in respect to forging pressure generally exhibits properties better than those in an axial specimen, but worse than those in a piece taken lengthwise. Similar conditions exist for substantially the same reason in the case of rolled parts. These are important facts for some foundrymen to remember when advocating the use of their castings in place of forgings.

Nature of Stresses Is Important Consideration

It will be noted, then, that the extent to which the forging may be found better for a given purpose than the casting depends partially on a factor already mentioned in connection with welded structures; in other words, on the nature, degree and direction of the stresses. This is not to say that physical properties in forgings and in welding are fairly comparable in the degree of resistance offered by the usual product. As a matter of fact, the typical forging will withstand much severer stresses, from directions apt to show the potential weaknesses

in the part, than would be borne by the ordinary welded unit.

Metals capable of being hot-worked are thereby improved in refinement of granular structure and in ductility. But it is not always the most ductile condition of a metal part that is desirable for a given application. That depends on the particular service under consideration. For instance, it has been determined by qualified investigators that wrought metals are inferior to cast metals of identical compositions for certain kinds of service that are of deteriorating nature. A notable example is high temperature application. Superior resistance of the steel casting in such service has been demonstrated by test results published by Spring and Kanter in this country and by experiments reported from England. The better behavior of the casting as compared with wrought material in some non-ferrous metals subjected to high temperature has been observed by unprejudiced metallurgists.

Resistance to Erosive and Abrasive Conditions

Laboratory experiments present difficulties for ascertaining the effects of gradual distortion called "creep," developed by continuously applied high temperature; and for measuring resistance to the slow but progressive loss of volume produced by wear or by chemical attack. All such tests need to be supplemented by meticulous observation of metals in service. Data are being accumulated, strongly indicating the better performance of the casting as compared with the forging, under some erosive and abrasive conditions; also in some applications where corrosive influences prevail. These are often associated with very severe stresses of kinds unrelated to chemical attack.

A case in point is found in marine application. The United States Navy adopted cast steel anchor chain as a standard, after conducting tests for three years, beginning with 1921, on castings and on wrought iron.

Some metallurgists believe that the superiority of the cast ferrous product is due to its larger grain structure as compared with that of the forging. Granular refinement is attainable by hot-working under proper conditions to a degree that is not accomplished by heat treating a steel casting. And the small grain structure produced in steel by mechanical hot-working develops the maximum degree of ductility potentially existing in the material.

Ductility Sometimes Undesirable

Researches that have been conducted with the forgeable metals suggest the possibility that other metals which may be cast but not forged might, purely as the result of their typical cast structures, be found well adapted for certain applications where

wrought metals are now frequently employed. Pertinent to this, it should be kept in mind that the greatest attainable degrees of ductility are not only superfluous, but are, in fact, undesirable, for some structural purposes. A metal part may be so ductile as to yield permanently to side thrusts and thus be bent out of alignment.

A final comment relating to forged material is in order. Lest it be thought that certain comparisons made result from prejudice, we foundrymen should freely concede the outstanding dependability of the forging as a general product for most purposes where it has been applied.

Design Is a Factor

FOUNDRYMEN have been helpfully stimulated by observing how effectively some welding experts have emphasized the importance of adapting design of the completed part to such components as may be economically produced. Not a few examples have been given impressive publicity, indicating important economies resulting from using "weldings" in place of castings. Constructional sense reveals the fact that some of the reported savings resulted not primarily from resorting to welding, but from changing dimensional features of the finished structures. In many such cases considerable benefits could have accrued to the users without employing any other material than redesigned integral castings.

We have fallen short of what we could have done if we had been better students and instructors in pointing out to users ways in which designs might be changed to result in less weight, lower cost for the rough casting, less machining expense for the piece and improved serviceability. Sometimes the latter advantage is unassociated with modified costs for foundry production or for machining.

Sharp Corner an Abomination

Every foundry operating executive should know that a sharp corner is an abomination. A lot of consumers do not understand that. The serious objection to angular connections applies whether a casting or a wrought piece of any metal is employed and whether the part is used in a rough or in a machined condition. Moore and Komers have convincingly shown this to be true.* Unquestionably much can be done to educate users regarding the

desirability of applying suitable fillets where members are joined.

It seems worth while briefly to stress this point, even to foundrymen who are not super-technical. It is not sufficient merely to eliminate all angularities, but it is wise to provide liberal radii for the fillets; and, further, to see that the contacts between the pattern and the leather or other material used for filleting avoid the junction of an angle with a curve.

Uniformity of Cross-Section Desirable

A very important point inadequately made clear to casting users relates to the highly desirable, reasonable approach to uniformity of cross-section. Perhaps many consumers know that the ideal casting has equivalent thicknesses of all sections. Everybody knows that a great many castings having variable sections are required. It becomes essential to explain to users that where unequal members of widely differing thicknesses must be joined a gradually tapering intermediate portion of the casting, connecting the thin and the thick parts, often serves greatly to make a more serviceable product.

There are other general details of design which can be stressed to the great advantage of all concerned. Perhaps the two mentioned are the most essential principles to be observed in providing for a casting of any kind of metal, the maximum resistance inherent in the material.

Naturally the relatively high degree of contraction of steel has prompted those who make castings from this metal to display more energy than has been exhibited by other foundrymen in urging adherence to metallurgically correct design. This is not completely altruistic. The steel foundryman's scrap pile is affected. But makers of all kinds of castings have opportunities for service to the consuming trades which, in some cases, might result in the retention of business considered for transfer to other industries where castings are not made. It is even conceivable that adequate attention to casting design might, in certain instances, enable a gray iron shop to hold business contemplated for diversion to the malleable foundry; and that the malleable producer might in the same way keep some customers who think seriously of future dependence on the steel foundry. Carrying the idea further, some steel foundrymen may perhaps retain patronage solicited by their competitors, by emphasizing the effects of natural laws governing the solidification of molten metal.

▲ ▲ ▲

Members of the Electric Hoist Manufacturers' Association report that the number of hoists ordered during November decreased 36.8 per cent, as compared with the previous month, and the value of such orders decreased 24.7 per cent. Shipments were 8.8 per cent greater in November.



*"The Fatigue of Metals," McGraw-Hill Book Co., New York.

DEVELOPMENT OF THREAD ROLLERS FOR RODS

By FRED R. DANIELS

Waterbury Farrel Foundry & Machine Co.

THREAD-ROLLING machines for screws and bolts are usually automatic in operation, and the dies are so located that the blanks travel in a vertical plane as they are rolled between the die faces. For this reason it is generally impracticable to thread automatically blanks larger than $\frac{5}{8}$ in. in diameter and 6 in. long. Hand-feed machines of the same basic

and is limited by the width of die face to 4 in. threaded length. The normal speed of the machine is 40 strokes a minute, but it is unlikely that long rods could be threaded at that rate even though two operatives were employed, which is usually the case.

A more suitable rod threader for work up to 60 in. in length is shown in Fig. 2. This also is a $\frac{1}{2}$ -in. ma-

chine, the chute filled and maintain a production of 40 rods a minute. To change from one length to another it is only necessary to adjust the position of the outer chute as required. The upper stationary die is adjustable to vary the die opening, the same as the hand-feed machine. The maximum threaded length is 4 in.

As the two machines just referred to are for single-rod threading, rods to be threaded on both ends must be handled twice. The machine shown in Fig. 3, however, is a double-end threader, semi-automatic in operation, with magazine feed.

Double-End Threader

WITH this machine it is possible for one operator to thread or knurl both ends of rods up to $\frac{5}{8}$ in. in diameter, ranging from 6 in. to 20 in. long, or two or more portions of such rods, at the rate of 40 a minute. In other words, for double-end threading, this machine doubles the production of the single-end semi-automatic machine for rods within its capacity for length. It is probably four times as fast and twice as economical as the hand machine. But for double-end threading on rods longer than 20 in., the hand or semi-automatic machine must be used.

Standing on a pedestal on the opposite side of the machine (Concluded on page 1630)

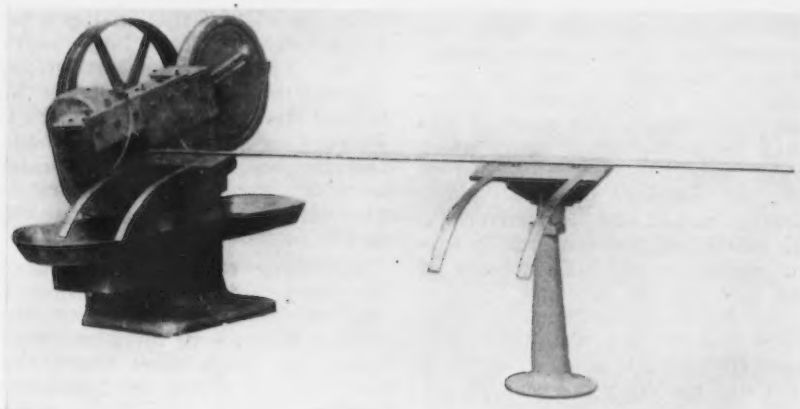


Fig. 1.—Threading one end of a long rod, with stand support for rod extension.

type, although capable of handling blanks greater than $\frac{5}{8}$ in. in diameter, are unsuited for long work falling within the classification of rods.

For threading headed rods (headed rods were described in *THE IRON AGE* for July 24, 1930), and for plain rods of unusual length, it is necessary to resort to a hand-feed rod threader. In this the dies are located so that the rod extends at the side, as shown in Fig. 1.

This illustration shows also the use of a stand for supporting the extending rods. The rods are held on the incline of the table and stand, and at right angles to the dies, by pivoting counter-weighted latches, while the operator pushes them in against a stop. The rods are thus located just in back of the lower or stationary die in such a position that the movement of the upper reciprocating die will cause them to roll through, depressing the latches which normally hold them back. After leaving the dies, the rods roll down the guides to the floor. The upper die is adjustable vertically to suit the diameter and depth of thread.

This threader is a $\frac{1}{2}$ -in. machine

chine; it is provided with a chute or magazine feed which can be regulated to take rods as short as 6 in. One operator standing in back of the feed chute bracket is easily able to keep

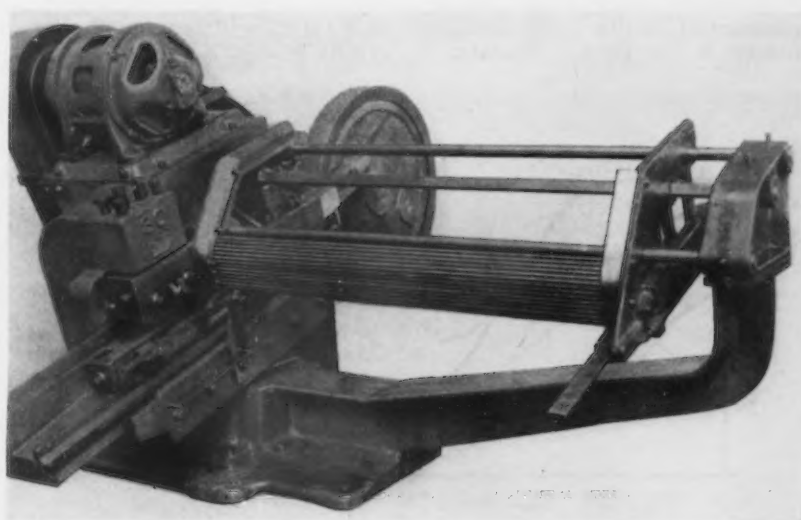


Fig. 2.—Magazine-fed thread roller for rods 6 to 60 in. long. This operates on only one end of the rod, as in Fig. 1.

Open-Hearth Men Discuss Alloys, Impact Strength and Rimming Steel



IMPACT strength of steel; influence of ferrite percentage; alloys in commercial steel; alloy contamination; a thorough-going discussion of rimming steel—these were among the matters taken up in some detail in Detroit, Nov. 25, by the Open-Hearth Committee of the American Institute of Mining and Metallurgical Engineers. Other parts of the proceedings were covered in THE IRON AGE of Dec. 3 and 10.

Physical Testing for Impact Strength

SEVERAL lantern slides showing characteristics of varying steels were used by Dr. Charles H. Herty, Jr., United States Bureau of Mines, in a discussion of impact strength of different steels for axle use. Two diagrams were placed upon a blackboard, to illustrate some of the points brought out. It was found, among other things, that impact strength longitudinally decreases about 2 ft.-lb. for each added point of carbon. Thus, in the curve, there was a drop from about 80 to 20 in impact strength, corresponding with an increase from 20 to 50 points in carbon. Although the curve is drawn as a line, the plotted points were scattered pretty well around, resulting in a broad band of points rather than a narrow or linear condition.

This matter was tied back to the percentage of ferrite in the steel, as indicated in the second diagram, in

which the relation between impact strength and ferrite content results in almost a straight line. It was concluded, therefore, that impact strength in general is entirely a function of the percentage of ferrite.

Strong Steel Not Always Clean

Some interesting developments resulted from this. Thus, addition of aluminum with resultant higher ferrite percentage gives a higher impact strength, although it may be associated with a considerably dirtier steel. An example was given of two billets from the same heat, which showed respectively 80 ft.-lb. and 60 ft.-lb. of impact strength, longitudinally, and 51 and 39 transversely. Both billets analyzed the same in carbon, manganese and silicon, being of about 0.20 per cent carbon. Analysis of the ferrite percentage, however, showed that the one with the higher impact strength had about 87 per cent ferrite and the other one only 70 per cent.

Steels treated with aluminum, while they show a higher average impact strength, give a much greater variation from one billet to the next. Dr. Herty voiced the suspicion that the aluminum addition causes the steel to crystallize differently, with resultant difference in the ferrite percentage. Investigations are being made with regard to the hardenability of steel as a function of ferrite. Preliminary results seem to show that hardenabil-

ity, as well as impact strength, goes along with ferrite content.

How Ferrite Percentage Is Ascertained

METHODS of determining ferrite and pearlite were explained. The earlier method adopted by the Bureau of Mines was to expand a photomicrograph of 100 diameters to about 10 times its normal size, giving a print which might reach as large as 15 x 30 in. This was then cut out with scissors, separating the ferrite indications from the pearlite, and the two weighed on a balance. This method, however, has been superseded recently by the use of a photoelectric cell, whereby one man can produce as many as 100 determinations a day.

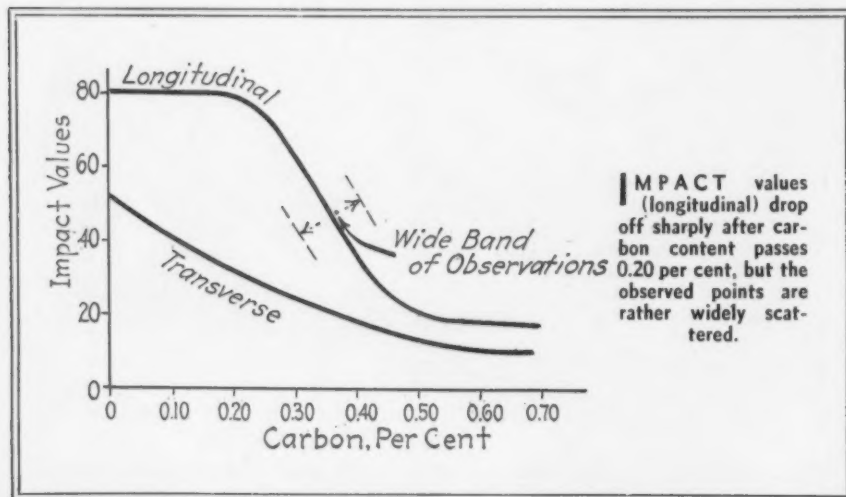
Regarding etching as a means of showing up seams and ghost lines, the speaker reported that electrolytic etching shows both these undesirable factors up much more clearly than they can be shown by hydrochloric etching.

Use of Alloys in Commercial Steel

WITH special reference to steel castings, a speaker traced the rise in percentage of alloy castings to total castings, from 4.3 in 1917 to 13.9 in 1928. He referred then to a partial swing back to plain carbon castings in the two subsequent years. This change was attributed to the increasing knowledge of methods and benefits of heat treatment of carbon steel, and further to the fact that competition has forced the making of a better grade of commercial steel today than was produced before the alloys came in so heavily. The proportion of alloy steel to total steel for both castings and ingots follows:

Year	Castings	Ingots
1917	4.3	3.6
1921	7.2	4.0
1924	7.7	5.2
1928	13.9	6.5
1929	12.2	6.8
1930	11.4	5.8

Special reference was made to locomotive alloy-steel castings calling for as much as 90,000 lb. to the square inch tensile strength and 60,000 lb. yield point, associated with 25 per cent elongation and 50 per cent reduction in area. Other alloy steels specifically mentioned were those used for



fittings in oil stills, in which they are subjected to pressures reaching 3000 lb. to the square inch and temperatures running from 900 to 1050 deg. F. This latter shows a red color in darkness.

Alloy Contamination

CONTINUING the report, which has been made semi-annually for several years, Dr. Herty stated that the scrap used in making open-hearth steel shows increasingly the greater use of alloys in the steels made. Inasmuch as the Bureau of Mines has completed its definite five-year program in these studies of steels, and is going into a different type of work on steels, the coordination of this alloy contamination program is to be carried forward through the Battelle Memorial Institute, Columbus, Ohio.

Practically every plant which had previously reported trouble from tin inclusions has been subjected to increased trouble from this source during the half-year now reported upon. And one or two plants which had no tin trouble before have begun to experience it. Copper seems to be in about the same position as six months ago, but the plants showing the greatest increase in tin troubles have had copper troubles also. The table gives some of these peculiarities.

Dr. Herty strongly recommended that plants having trouble with these components give more complete reports as a basis from which the matter may be more carefully surveyed. The chairman added to this plea one for a larger number of companies furnishing samples for analysis. Along the same line Clyde E. Williams, Battelle Memorial Institute, asked that data on the rolling of steels in which some of this trouble occurs might come along with the samples for analysis, so that a basis might be had for attack on the problem in a way which would give some possibility of getting somewhere on it.

Rimming Steel and What It Is

ARÉSUMÉ of the matter of rimming steel, in a paper by Henry D. Hibbard, Plainfield, N. J., was read by one of the members. In introducing the matter, the chairman referred to the fact that Mr. Hibbard produced probably the first rimming steel ever made—as far back as 1887.

Boiler and ship plates, sheets, wire, pipe and a number of other important products, Mr. Hibbard said, are made of rimming steel. Its characteristics are a high ductility and a sound skin; it has better weldability than other forms of steel and is characterized by having no pipe; it is a cleaner steel than that which is killed, due to the separation of inclusions into the scummy formation on the top.

Just below this scummy or spongy top, the steel is as good as at the bottom, or sometimes better. The deep-seated gas holes, characteristic

Alloy Contamination of Open-Hearth Steel

December, 1929-July, 1931, inclusive.				
Annual Capacity Represented				
Dec., 1929-Feb., 1930.....	6,600,000 tons			
March, 1930-July, 1930....	8,700,000 tons			
Aug., 1930-Feb., 1931.....	8,600,000 tons			
March, 1931-July, 1931....	8,600,000 tons			
Average Results of All Plants, Per Cent				
Element	Dec.-1929-30	March-1930	Aug.-1930	March-1931
Manganese	0.224	0.196	0.205	0.19
Chromium	0.030	0.033	0.026	0.034
Nickel	0.043	0.055	0.044	0.045
Copper	0.099	0.103	0.092	0.091
Tin	0.010	0.007	0.007	0.012
Maximum Results, Per Cent				
Manganese	0.42	0.42	0.43	0.35
Chromium	0.080	0.127	0.080	0.054
Nickel	0.090	0.129	0.139	0.089
Copper (a)	0.219	0.227	0.248	0.268
Tin (b)	0.041	0.041	0.053	0.078

(a) Three last from the same plant; 0.208 in first period. (b) All from same plant.

of this steel, are not detrimental for most of the uses to which the steel is put. When, however, there is a zone of skin holes on the bottom and running up the sides, conditions are not so good and segregation is pronounced.

Its quality of better weldability makes it in demand, particularly for the production of pipe. Its improved surface, noted particularly on sheets, makes it in special demand in the automotive industry.

Working Out the Gases

Gases of effervescence worked out of this steel through its action in the mold are essentially CO, the same as those which make the bath boil in the furnace. Globules of these gases are successively set free as the saturation temperature of the steel is passed in cooling. Too strong an effervescence causes the steel to settle after or during rimming, while too weak an effervescence makes it rise. The steel maker aims at a slight settling, which can then be easily corrected. Steel excessively hot, say above 2950 deg. F., seems to be free from this effervescence and rises in the mold.

Three kinds of gases were discussed by Mr. Hibbard. These are respec-

tively those found in the skin holes, those in the intermediate holes and those in the central holes, which occur at random. Skin holes are the worst enemy of rimming steel. They are likely to develop scale in heating and to cause pits on the finished surface. The gas here is mainly hydrogen. To minimize the skin holes calls for a strong effervescence right from the beginning of teeming the ingots.

Intermediate holes, in well-made rimming steel, lie quite uniformly from 2 to 3 in. in from the surface. The largest of them are from ¼ to ½ in. in diameter.

Central holes are usually present in irregular amounts. While they are not definitely understood, they are supposed to be bubbles of either nitrogen or ammonia. Sometimes when an ingot is broken open there is a strong smell of ammonia, believed to come from this source.

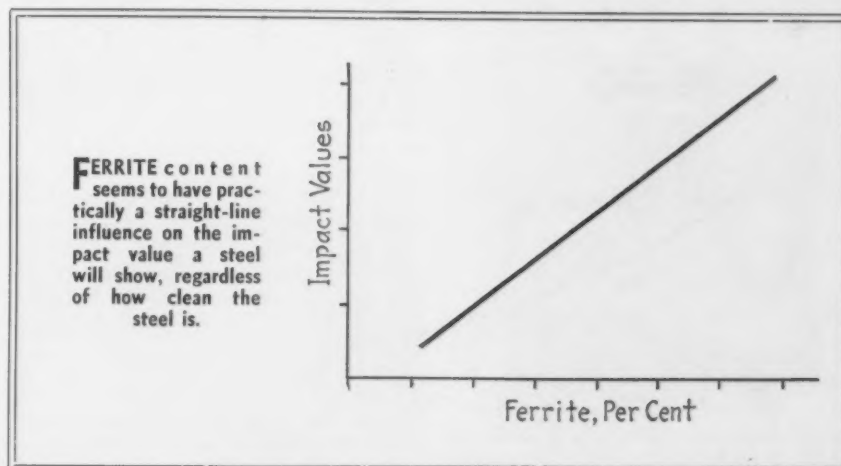
Getting the Proper Melt Characteristics

To make a good rimming steel, Mr. Hibbard recommended proportioning the pig iron and the scrap so that the bath will melt with about 0.50 per cent carbon and 0.20 per cent manganese. A strong boil then will eliminate much of the gas which otherwise would go into and form skin holes. This boil must be distinctly more vigorous for ingots which are to be top cast than for those to be bottom cast, mainly because the top cast mold is filled so much faster and gives so much less opportunity for escape of gases.

Rimming steel is sometimes called over-oxidized steel; but steel with a residual manganese of 0.10 to 0.15 per cent is decidedly not over-oxidized. A finish at between 0.35 and 0.45 per cent manganese, preferably midway between these figures, is usually aimed at. If there is too much manganese in the charge the bath will almost certainly be sluggish in its action, with effervescence totally inadequate.

In discussion, Dr. Herty mentioned that, as the manganese in rimming steel increases, the amount of hydro-

(Concluded on page 1630)



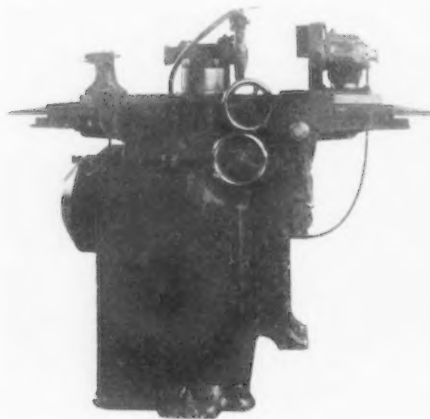
New Tool and Cutter Grinder with Box Type Bed

TO keep in proper working condition the great variety of cutters and tools required by modern complicated and diversified machining operations, a new 12 x 32 in. tool and cutter grinder, designated as type B, has been brought out by the Landis Tool Co., Waynesboro, Pa. Accuracy, dual controls, and sufficient capacity to accommodate some of the larger toolroom work are among the features emphasized.

Location of certain of the controls both at front and rear of the machine permits operation from either side as most convenient. The work table guideway construction is so designed that little effort is required to traverse the table. Other design features facilitate moving the workhead or footstock, changing wheels, raising or lowering the wheelhead and applying the various attachments.

A water reservoir is cast integral with the bed, which is of box type and incloses the driving motors for grinding wheel and traverse mechanism. The third or workhead motor is mounted on the workhead itself. Motor control is by three separate snap switches at the left-hand end of the bed. Three traverse speeds are obtained by shifting a flat leather belt driven by the motor within the bed at the right. This motor can also be used for driving the pump of the wet grinding attachment. The grinding

DUAL controls are provided as shown in front view (at right) and rear view (below). The workhead swivels 90 deg. in either direction.



wheel motor is at the lower end of the column; reversal of its two-step pulley gives a second grinding speed. Regardless of the position of the wheelhead, which can be swiveled 90

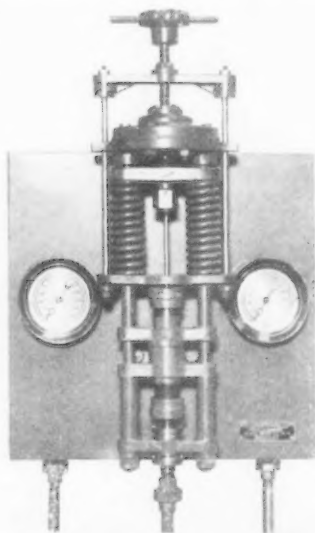
deg. in either direction, the driving belt never runs in a twist.

The workhead can be swiveled either vertically or horizontally and can be used for either dead-spindle or live-spindle grinding. Its motor is mounted on a slotted plate for adjusting tension of the drive. Grinding wheels up to 8-in. diameter can be supplied with standard equipment. Plain or universal equipment is offered; in addition, the machine can be supplied with multi-speed workhead and footstock for light production or special toolroom work. This heavier head gives six work speeds with a constant motor speed. A special head for surface grinding is also obtainable.

Without electrical equipment, the plain machine weighs 2325 lb.; the universal machine, 2525 lb.

Automatic Relay Valve

A RELAY valve designed to give accurate pressure control of steam, water or gas lines has been



announced by the Bailey Meter Co., Cleveland. Control of the pressure within close limits is obtained by regulating the movement of a syphon-operated or piston-operated throttle valve installed in the line in which the pressure is to be controlled. A small change in the controlled pressure will result in a relatively large change in the motive pressure used to operate the regulating valve.

The control pressure acts on a diaphragm against spring pressure. A motive pressure of air, water or steam, supplied at 50 lb. per sq. in. or more, is regulated by a diamond valve which is actuated by movement of the diaphragm. When the line pressure exceeds the required amount, the resulting motion of the diaphragm opens the diamond valve, thus increasing the controlled pressure at the piston or syphon of the line throttle valve.

At the top of the device is a handle which can be used to adjust the springs to balance the controlled pressure as indicated on the pressure gage at the left. The relay pressure

is shown by the gage at the right. A special device, making it possible to obtain any desired speed or lag, consists of micrometer adjusting nuts for varying the seat gap of the diamond valve. The relay valve is designated as style G.

Small Bench Drill

A SMALL drill press of conventional type, designed especially for home shop work but suitable also for light production work, is offered by Ogden R. Adams, 266 State Street, Rochester, N. Y. Known as the Knipson bench drill, it is adapted for drilling either metals or wood up to the 5/16-in. capacity of the drill chuck. The machine will drill to the center of an 8-in. circle; the greatest distance from table to bottom of chuck is 7 in. A universal motor bracket can be supplied for a 1/6 or 1/4-hp. driving motor, and, when used, replaces the countershaft. Exclusive of motor, the drill weighs 15 lb.

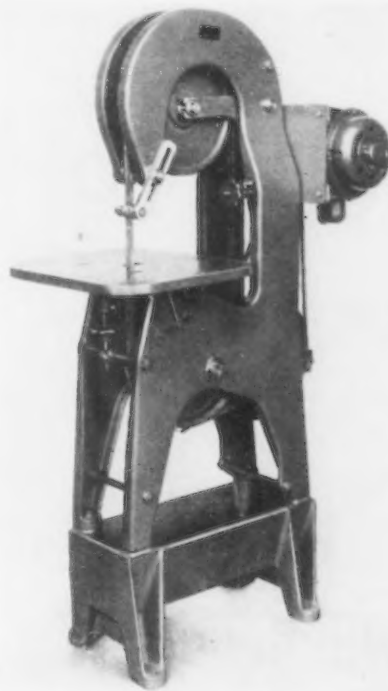
New Model Continuous Band Filing Machine

GROB BROS., West Allis, Wis., has announced a new model of its floor type continuous band filing machine. Designated as Type A-2, the machine incorporates a number of improved features designed to increase the speed and accuracy in filing and lapping of punches, dies and other parts. The two side members are spaced closer together at the upper part of the machine to provide protection to the operator from the revolving chain and to increase the visibility of the work. The two 13-in. sheaves over which the file chain operates, as well as the reduction drive pulley, are mounted on ball bearings.

Positive drive of the chain is obtained through a series of equally spaced drive pins mounted in the lower sheave and matching with the links of the chain. The drive pins are located in the center of the groove in which the chain operates and are cushioned by helical springs

so that they can adjust themselves properly to the links of the chain, insuring a positive drive, yet not stretching nor harming the chain. Larger V-belts and a more powerful motor together with the positive chain drive are said to allow stock to be removed at a speed approaching that of the action of a milling cutter.

Adjustment of file chain tension is secured by means of a handwheel cushioned by a helical spring and provided with an adjustable pin which prevents over-tightening by acting as a stop against the handwheel as soon as the ring is properly compressed. The files are guided against the hardened and ground surface of the replaceable back-support by a rubber covered roller on a ball-bearing shaft, adjustable for height. The work table measures 17 x 21 in.; it can be tilted by means of a small handwheel. Overall height of the machine is 63 in.; it weighs 500 lb.



The frame narrows at top to guard the chain and to increase visibility.

Automatic Drivehead with Self Contracting Feature

AUTOMATIC contraction and expansion of the grinder as it is withdrawn from and inserted into the bore of the work is an important feature of a new drivehead placed on the market by the Hutto Engineering Co., Detroit, for use in conjunction with its standard production grinder or hone. The automatic feature is intended to save the time required for

manual expansion or contraction of the grinder. The unit was developed with a view to obtaining faster stock removal, greater accuracy, maximum stone life, and higher quality of finish in internal grinding work.

One major setting of the micrometer adjustment is all that is required to grind all bores of the same diameter to equal limits. Additional adjustment can be made occasionally to compen-

sate for abrasive wear. Anti-friction bearings are used throughout the adjusting mechanism and all wearing parts of the drivehead are hardened and ground. It is constructed to withstand high production rates.

Portable Hardness Tester Does Not Mar Work

A NEW hardness tester which employs the principle of a falling pendulum has been placed on the American market by the R. Y. Ferner Co., 1129 Investment Building, Washington. This instrument, known as the Duroskop, is portable; tests can be made rapidly as the entire procedure consists of holding the tester against the piece to be tested and pressing the pendulum release button on the back of the case. The pendulum strikes through a hole in the edge of the case against the work

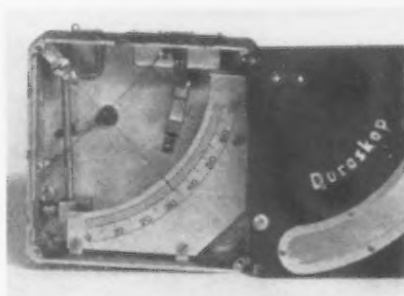
and, in rebounding according to the hardness of the piece, it carries with it a light pointer which remains at the highest point on the scale to which the pendulum rises.

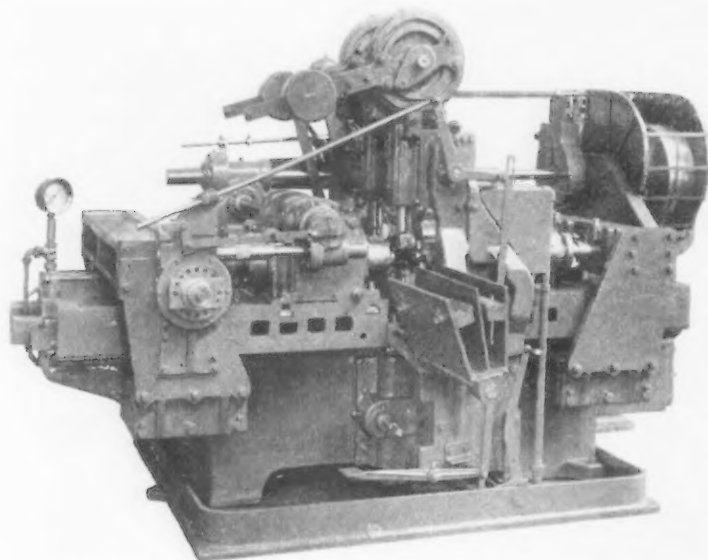
The pointer scale is prevented from shifting by a wire stretched across it which presses down on it slightly and causes it to rest against the edge of the scale. When a reading has been made with the instrument the pendulum is restored to its upper position by turning a spring-actuated lever.

While being raised to this position the pendulum carries the pointer to the upper end of the scale. The section of the scale just beyond the 70-deg. mark is bent upward, however, and when the pointer reaches this inclined surface it is raised out of engagement with the pendulum and then can be brought back to the zero position by means of a lever on the front of the instrument case.

Tests Cylindrical Pieces

Crossed V-grooves in the edge of the instrument which is placed against the work give proper settings against cylindrical pieces in either a horizontal or vertical position as when checking case-hardened rollers. The instrument has the special advantage of not marring the surface of the piece being tested. Because of this it can be used in testing ceramics as well as metals. It has also been used in testing metal less than 0.002 in. thick. It is 4½ in. square, 1¼ in. thick and weighs less than 13 oz.





Improved Radiator Loop Facing, Boring and Tapping Machine

SEVERAL marked improvements have been made in the single-purpose facing, boring and tapping machine for hot water and steam heating radiator loops which was brought out by the Moline Tool Co., Moline, Ill., in 1929 and announced by THE IRON AGE of that year in the June 27 issue. In the new model R-600 machine, Oilgear hydraulic feeding mechanism is used for the facing operation. Individual lead screws are provided on the spindles for the tapping operation. The lead screw nuts can be readily transferred from the frame of the machine to the spindles when changing from thread-nipple to push-nipple loop work.

Provision is made for individual adjustment for depth of each facing

tool and tap; the control of the depth of the tapping or reverse is entirely independent of the lead screws. Three different speeds can be obtained with regular equipment through pick-off gears; this permits regulation of tapping or facing speed as required by the hardness of the loops. Greater speed of loading and unloading is now made possible by a new loading device or cradle which is adjustable for various widths of radiator sections.

Anti-friction bearings are installed throughout. The gears run in oil, having tight retainers designed to prevent waste or slopping of lubricant. The machine is set in a heavy welded-steel pan which has a three-point bearing on the floor to prevent any possible distortion of the frame.

Collapsible Steel Barrels for Bulk Shipments

SHEET steel returnable barrels, known as Bell collapsible containers, are being marketed by the Shipping Container Corp., Cape Charles, Va., for use by shippers of bulk hardware and other products. When collapsed, seven of these containers can be nested in the space required for one wooden barrel.

The two side sections of the barrel, as well as the top and bottom, are assembled by inserting buttons or loops stamped along the sides into corresponding holes punched in the adjacent sides. Locking rods are passed through the loops of the side seams within the barrel, thus fastening the side sections together. The top and bottom are similarly fastened by wires passed through the

loops around the outside of the barrel. These wires can be locked by twisting, or by a lead seal.

The barrel sections have double edges, crimped at top and sides. A special barrel of heavy gage metal is offered for heavy duty and returnable container service.

Device Facilitates Pouring from Conveyors

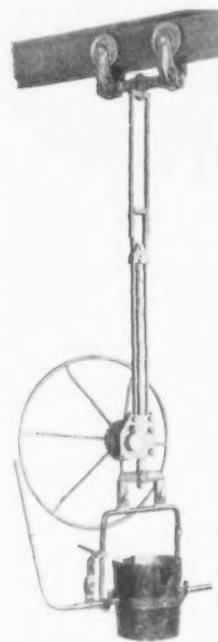
A NEW pouring machine has been designed by Modern Pouring Device Co., Port Washington, Wis., for pouring ladles of 100 to 200 lb. capacity into bench molds. The new design is applicable to moving conveyors, where considerable height of lift is usually required.

A gear-and-rack raising attach-

ment operates in conjunction with a ratchet and Western-type brake. This operation is accomplished by means of a light electro-welded hand wheel. The ladle is raised by a clockwise rotation of this wheel, and lowered by a reverse rotation.

For extreme ease of operation, the gearing is mounted on ball and Hyatt roller bearings, and is inclosed in a steel housing. The rack, of cut steel, is guided at the upper end with a guide mounted on anti-friction bearings. A ladle lock holds the ladle erect while transporting it to the pouring floor. No. 2 type bail and shank are provided, especially adapted to conveyor pouring.

An adjustable hanger frame fits the machine to various headroom heights. This hanger frame is mounted on a Timken roller bearing adjustable-wheelbase trolley. The trolley frame is malleable iron. The trolley can be set with the large wheelbase for operation on straight track, or with the smaller wheelbase for operation on small-radius curves.



This 71-in. rustless-steel orifice plate, in connection with a flow-meter manometer, will measure the blast furnace gas at a Russian steel works. Several others will be shipped to the same destination and used with air blast measuring instruments made by the Brown Instrument Co., Philadelphia.

Machine Tests Torsion Springs Under Operating Conditions

LOAD tests of torsion springs can be carried out under conditions practically identical with operating requirements by means of a torsionometer recently brought out by the Coats Machine Tool Co., 110 West Fortieth Street, New York. Springs up to 8 3/4 in. long, 9 7/8 in. diameter and having a maximum wire diameter of about 0.157 in. can be tested on the model T-60 machine here illustrated. This model has a maximum capacity of 60 kg.-cm. or approximately 52.08 in.-lb. Models T-3 and T-600, having capacities of 3 and 600 kg.-cm., are also offered.

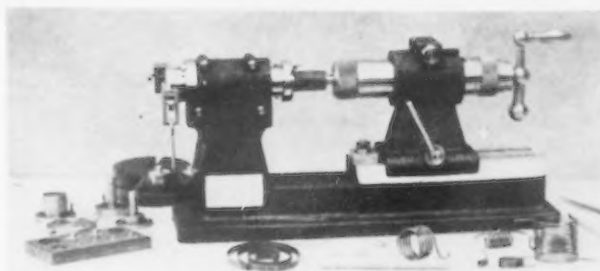
The machine bed has a raised headstock support for the scale and V-guides for the tailstock with an automatic stop for locating the testing position. The spring to be tested is

mounted on its arbor and placed in the machine with tailstock withdrawn. The tailstock is then moved back to the stop where it is clamped. A tube, which slides within the tailstock and can be held by means of a clamping screw, contains the driving mechanism. On the outer end of this tube there is a disk graduated in degrees, a counter for 25 revolutions, a driving crank and a knurled collar for locking the driving shaft under load. The work arbors are provided with a taper and are held to the drive-tube by a chuck.

A flange on the scale carries a dog

that connects with the spring. The torsion load of the spring is transmitted through the scale to a beam having an effective length of 10 cm. A 6-kg. weight placed on the end of this beam gives the normal maximum "moment of torsion" of 60 kg.-cm.

It is pointed out that requirements for torsion springs are generally expressed as the "moment of torsion" for a given angular twist. The machine, which is described as being simple to operate, facilitates torsion measurements at various angular twists and while the loading is being increased or diminished.



Aerator Equipped with Three Ball Bearings

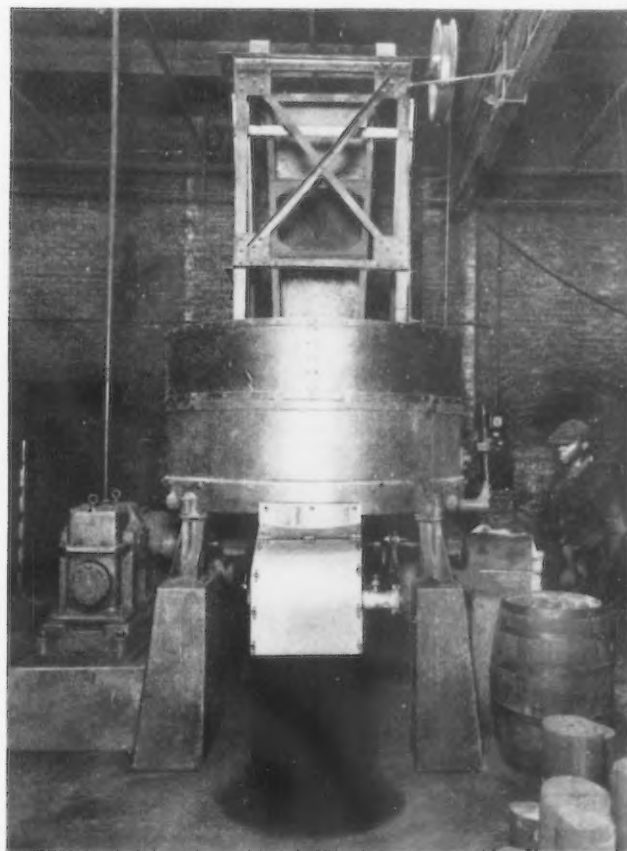
ASAND aerator, so designed that it can be installed on any No. 2, 6-ft. diameter pan, Simpson intensive

sand mixer, is being marketed by National Engineering Co., 549 West Washington Boulevard, Chicago. It is possible that this machine will be developed in other sizes also, at a later date.

It will take the peak load of the mixer and will discharge the sand

into wheelbarrows or boxes, or on the floor, in a fluffy and moldable condition. This aerator consists of a steel drum, which is mounted on a shaft carried on three ball bearings. The drum is equipped with a removable cage consisting of longitudinal steel plates, the cutting edges of which are notched to give maximum cutting and aerating action.

A by-pass gate is provided so that, if core and facing sands are both mixed in the same machine, and it is desired to aerate only certain batches of sand, this gate can be thrown and the sand will then be discharged directly from the mill, without going through the aerator.



THIS aerator is designed to take the peak load of a 6-ft. diameter pan mixer.

Rotary condensation meters, manufactured by the American District Steam Co., North Tonawanda, N. Y., in capacities up to 6000 lb. water an hour, are now offered in two additional small sizes having 250 and 500 lb. capacity. The meters are of the bucket type; as the buckets are filled, the weight of condensate causes rotation. A dial registers the measurement in pounds.

Shipments of electric industrial trucks and tractors totaled 21 units in November, against 17 in October, according to reports received by the Bureau of the Census from 10 manufacturers. In the first 11 months of the current year 611 units were shipped, as compared with 1038 in the corresponding period of last year.

Foundry Equipment Orders Drop in November

Foundry Equipment Manufacturers Association reports a marked decrease in bookings in November, orders for that month being represented by the index figure 17.2, compared with 44.8 in October, 31.9 in September, 16.9 in August and 38.7 in July. The association derives its base 100 from the average monthly shipments of 1922, 1923 and 1924.

19,000 Associations Listed in New Government Book

WASHINGTON, Dec. 22.—The new directory on "Commercial and Industrial Organizations," just issued by the Department of Commerce, discloses a striking growth of organized cooperation in American business. The compilation contains the names of more than 19,000 organizations, among which are national and interstate organizations exceeding 2600, State and territorial organizations of more than 3000 and local organizations totaling 13,600. The total represents an increase of about 45 per cent over the number contained in the 1929 edition.

The department announcement said that this increase probably represents a more complete listing rather than an actual increase in the number of organizations, though the latter has been a considerable factor.

Copies of "Commercial and Industrial Organizations of the United States" are available at 85c. each at any of the district offices of the Bureau of Foreign and Domestic Commerce or the Superintendent of Documents, Government Printing Office, Washington.

Wholesalers' Associations Urge High List Prices

A joint list price committee of the National Supply and Machinery Distributors' Association, the Southern Supply and Machinery Distributors' Association and the American Steel Warehouse Association, headed by Wendell H. Clark, vice-president, Samuel Harris & Co., 114 North Clinton Street, Chicago, has prepared a report which will be sent to all manufacturers who sell goods to the members of these associations on a list and discount basis.

A recommendation of the committee is that manufacturers establish a high list price so that the wholesalers can give a selling discount to their trade of 50 to 80 per cent. The report says in part:

Our joint list price committee is in favor of manufacturers setting the list price high enough for a selling discount of between 50 per cent and 80 per cent to the trade, with our cost price beyond

that. As for example, our cost is 70-25 per cent, denoting 70 per cent resale and 25 per cent as our gross margin. This is an easy way to suggest a resale to the distributor. Both the selling and cost discounts can be quickly seen. The distributor immediately knows his gross margin, whereas, if the suggested resale is 40-5 per cent and the cost 50-10 per cent, to find our gross margin resolves itself into a mathematical problem.

We believe that long discounts of this type will materially reduce the obsolescence of list prices in our catalog, because it takes care of the price fluctuations with which manufacturers naturally contend.

We recommend, as far as possible, that the same discount be applied to the entire line, but that, where this is not possible you attempt to at least cover all sizes of the same item with the same cost and resale discount.

Further Decline in Factory Wages

Average weekly earnings in representative New York State factories, including all employees in both office and shop, are reported for October by the State Industrial Commissioner at \$25.34. This is a drop of 82c., or more than 3 per cent, from the \$26.16 of September, and is almost 10 per

cent below the \$27.96 in March, which was the highest for any month of 1931. The average in October, 1930, was \$28.03 and in October, 1929, \$30.08. The highest for any month was \$30.47, in September, 1929.

Discuss Alloys, Strength and Rimming

(Concluded from page 1625)

gen going off from the steel increases with it. He suggested that the source of this superfluity of hydrogen might be in the presence of too much of that gas, in some cases, in the ferromanganese used.

Higher percentages of residual manganese with low-carbon steels were reported by one operating man, with beautiful rimming effect. In his case, with 0.08 per cent carbon, this residual manganese often is as high as 0.25 to 0.28 per cent. He believes that, if he had to work his heat down to 0.15 per cent manganese, he would lose a lot of time and tonnage. His ingots were reported to give a 2 or 3-in. skin, which is as good as one could ask for. He thinks that many troubles with rimming steel are due to an improper silicon content.

Development of Thread Rollers for Rods

(Concluded from page 1623)

site side of the machine, the operator takes the blanks from a work box placed on a conveniently located shelf. Upon gravitating from the chute, the rods are acted upon by a pusher mechanism which transfers them successively to the dies. While the operator is first filling the chute, this pusher mechanism is withheld from operation by a mechanically operated gagger.

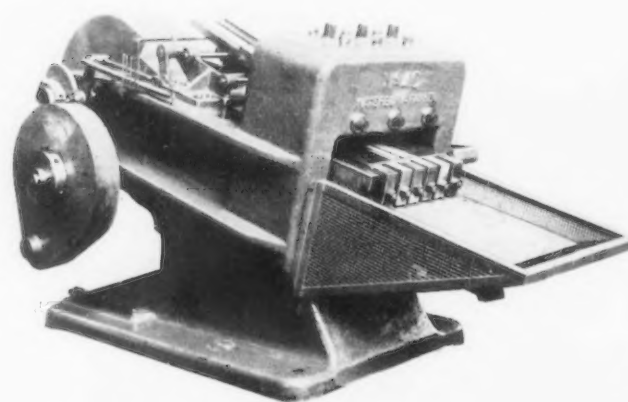
As soon as the chute is filled the gagger is released, permitting the pusher to deliver the rods to the dies. From this point on the operator is easily able to keep the chute filled. When the threaded rod reaches the end of the upper stationary dies, it is

prevented from rolling back through the dies by a stripper and then falls on to an inclined apron.

The dies are spaced by filler blocks and can be arranged as desired to suit the location of the threaded or knurled portions and, as in the other machine shown, the upper dies can be adjusted to suit the diameter. The maximum threaded length is 2½ in. at each end or threaded portion.

All of these machines, which are included in the thread-rolling equipment built by the Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., can be had in sizes other than those shown, to suit practically any requirement.

FIG. 3.—Automatic double-end threader for rods 6 to 20 in. long, which works on both ends of the rod simultaneously, or on any intermediate parts of the rod, as required.



Does P/V Line Indicate Early Upturn?

By DR. LEWIS H. HANEY

Director, New York University Bureau of Business Research

FAVORABLE FACTORS

1. Large gold reserves; strong Federal Reserve ratio; ample free gold; loan-deposit ratio normal.
2. Speculative credit, measured by brokers' loans, is thoroughly deflated; stock market liquidation probably over 80 per cent completed.
3. Progress toward relief of railroads through rate adjustments, voluntary credit pool, and wage reductions.
4. Probability that many good bonds will be sought out by bargain hunters as soon as monetary fears are relieved.
5. Possibility that the proposed Finance Corporation may have a favorable "psychological effect," while limited so as to prevent inflation.
6. Wheat prices at this writing still hold a part of the autumn gain.
7. World copper producers reported about to reach a workable agreement for "stabilizing" the industry; copper market stronger.
8. Machine tool orders gained more than seasonally in November.

UNFAVORABLE FACTORS

1. Commodity prices continue to decline.
2. Factory employment and payrolls at new low levels.
3. Sales of department stores, mail order and chain stores declined in November.
4. Foreign trade below 1921 bottom, both exports and imports touching new lows.
5. Unfilled steel orders fell sharply in November, despite small shipments.
6. Building activity fell sharply last month, reaching a level below the 1921 bottom.
7. Automobile sales continue depressed.
8. No relief yet apparent from accumulation of surplus stocks of various basic commodities.
9. Large amount of frozen investments and security loans still burden the banks.
10. Growing uncertainty as to value of money tends to paralyze business; proposals to inject government credit into the Reserve System increase uncertainty.
11. Large government deficit and uncertainty as to adequacy of Administration's program for balancing budget.

UNQUESTIONABLY the definite and positive factors in the situation remain almost entirely on the unfavorable side of the business balance sheet. Those potentialities on the favorable side are calculated rather to relieve fears and help "sentiment" than to bring actual improvement in fundamentals. The real progress continues to be found in liquidation of inflated "situations" and correction of the remaining maladjustments.

Meanwhile, the general trend of business continues downward, and November data indicate new low levels. The rate of decline appears to be more moderate, but no definite indication of a turn has appeared.

Most immediately pressing may be the position of the banks, which are carrying investments at prices far above the "market," and loans on securities with thin margins. Doubtless many hope that the "Finance Corporation" will relieve this pressure.

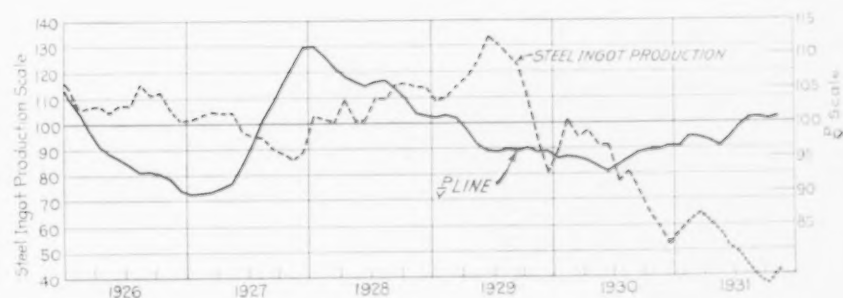
Reassuring the country as to the maintenance of a sound basis for its money is the most fundamental problem. Not only is there a great world need for a stable pound sterling, but there is a great domestic need for assurance that \$100 will be one hundred gold dollars a year from now. These needs should be met at once. Nothing would do more to restore strength to the bond market and lay a basis

for business confidence than assurance that the Reserve System will continue chaste and that a dollar will equal 23.22 grains of pure gold—*without any shadow of a doubt*.

Many maladjustments have been corrected: Brokers' loans are completely deflated. Many prices are low enough. Economy in production and more reasonable standards of living are being established. But so long as men worry about the safety of their principal, and even fear to hoard lest the thing hoarded shrink in value through inflation, business will remain paralyzed.

Our P/V line, which is moving sidewise at about its estimated normal level, is difficult to interpret. We have no experience to go by. It turned up in early 1921, when prices declined less rapidly than the volume of trade. But probably the only analogy would be found in the '70's or the '90's, for which period no data are available. So many prices are "nominal," and the basis of values is so much in question that we must remain uncertain.

Possibly the action of the P/V line is one of several indications that the period of the ordinary forty-month business cycle has reached the time when we should be well along in the ascending phase, without any more correction needed than some steadying in prices.



The Iron Age, December 24, 1931—1631

DOES the steadiness in the P-V line at about "normal" indicate that our period of stress is about to be relieved and an ascent to greater activity to begin?

This Issue in Brief

Wrong: Technological Unemployment. Right: Technological Displacement. The machine is not a job-destroyer. When it closes one employment door it opens another larger door.—Page 1606.

Storage battery charging rate in amperes should never exceed the ampere-hours out of the battery.—Page 1610.

Torsion test measures strength of tool steel. Ultimate torque and total angular deformation are employed to arrive at a "coefficient of toughness."—Page 1615.

Brickmakers beware! Ext. for walls of future buildings will be metal, lighter, stronger, less bulky, easily shaped and insulated.—Page 1619.

Prospective user of welding where stresses are high should determine the properties in the deposited weld-metal; in the joint between weld and parent metal; and in base metal adjacent to the welding zone.—Page 1621.

Foundryman who competes with welder should consider not only cost, says foundry group head, but various physical properties, weight, number of pieces required, and expense of pattern equipment.—Page 1621.

Cast metal superior to wrought metal at high temperatures. Found to be more resistant to "creep," due, perhaps, to larger grain structure.—Page 1622.

"The good old days" are vastly over-rated. Machine haters overlook the 12-hr. days, child labor, misery and want of the pre-machine era.—Page 1605.

Depression is not machine-made. The machine is the economic motor and will work if the carbureter (capital management) and the gas tank (credit) are unlogged.—Page 1607.

If the steel is unmachineable, don't blame inclusions, for the chances are that the structure of the steel is wrong. Best machineability is obtained when hardness and ductility are at a minimum.—Page 1609.

For long tool life in machining chrome steel transmission gears, heat above the upper critical point, cool fairly slowly through the critical.—Page 1662.

Days of wide fluctuations in scrap prices are over, says scrap association head. Tells old material men that profits will come from merchandising rather than speculating.—Page 1637.

Savings obtained by change from castings to "weldings" are often due to improved design. Savings would be realized if casting design were improved.—Page 1622.

Is foreign business essential to our prosperity? Imports and exports run about three billion dollars a year each way; our national income totals about 84 billions. If we did no foreign business we should still have a big turnover.—Page 1643.

Unburned magnesite brick shrinks less than burned brick, resists deformation at higher temperature, spalls less.—Page 1637.

Steel is embrittled if placed in contact with certain other metals (tin, zinc, copper, aluminum, et al.) only if the other metals are heated to a liquid state.—Page 1607.

Increasing the hardening temperature of a chromium tool steel increases the drawing temperature at which the peak of strength occurs.—Page 1616.

Germans develop new aluminum alloys for aircraft motor use. Titanium is used extensively. Other alloys are antimony, nickel and magnesium silicide.—Page 1663.

Don't worry the captain while the storm is raging. He can't stop the storm, says George M. Verity. Better get behind him and help.—Page 1635.

Will more railroads fail? With railroad bonds selling at yields more than double those on short term Government notes, it is hardly "alarmist talk" to say that receiverships are in prospect. But receivers, too, are buyers.—Page 1643.

Hardness of tool steel is not inversely proportional to toughness. Specimens hardened at 1550 deg. F. show a regular decrease in ultimate torque and hardness values with increasing drawing temperatures. For higher hardening temperatures strength and hardness are inversely proportional.—Page 1617.

NEXT WEEK

IN a country in which consumer industries loom so large the future of production depends in considerable degree on the creation of new wants and the development of new products. One way to approach greater diversification is through stabilization pro-

grams which will protect mature industries from overdevelopment and divert capital to new enterprises. It is only by creating new outlets for capital and labor that demands for old products can be increased, says a writer in our next issue.

BEARINGS FOR HEAVY-DUTY SERVICE

A SYMPOSIUM on the general subject of bearings for heavy-duty service was held in New York at the annual meeting of the American Society of Mechanical Engineers. This was sponsored by the special Research Committee on Heavy-Duty Anti-Friction Bearings. Five papers were presented and then discussed as a group. Brief abstracts of the successive papers follow, with the high points of the ensuing discussion.

Millwright Bearings for Roll Necks of Medium-Sized Rolling Mills

IN a paper by K. W. Atwater, mechanical engineer, H. A. Brassert Co., Chicago, the following points were brought out:

Metal roll-neck bearing performance is frequently unsatisfactory, particularly with regard to rapidity of wear and excessive power loss in friction. Roller bearings, although free from these disadvantages, are comparatively expensive, and are limited in applicability because of their space requirements. These circumstances provide a definite field of usefulness for bearings made of very hard wood.

Tests of various species of lignum-vitæ, and of different methods of cutting bearings from the log, have indicated specifications under which satisfactory lignum-vitæ bearings can be produced. Bearings produced according to these specifications are used successfully in many rolling mills and can be lubricated adequately by means of water sprays. With such lubrication, the rate of wear and the power loss in friction are considerably lower than those of metal bearings lubricated with oil or grease.

Save Power and Last Long

In some rolling mills the use of this type of bearing has effected power savings as high as 23 per cent in comparison with metal bearings. Tests have shown that their life in certain cases is 15 times that of metal bearings.

Average life of metal roll-neck bearings on an 18-in. continuous strip

mill was about 80 hr. running time. Lignum-vitæ bearings on the same mill, measured after 672 hr. running time, showed $\frac{3}{8}$ in. of wear on the bearing surface. On certain finishing stands of a mill in the Chicago district, where metal bearings had to be replaced every three or four weeks, lignum-vitæ bearings served for 13 months without replacement.

In the finishing stands of a continuous rod mill in the Pittsburgh district, rapid wear of both the lignum-vitæ bearings and the roll necks occurred immediately after installation. This continued until the roll necks had become highly polished, removing about $\frac{1}{8}$ in. of the material of the bearing. This condition having been attributed to the initial roughness of the roll-neck surface, the practice was adopted of buffing the roll necks before installation in the mill. Results: The starting torque of the mill was reduced considerably, and the life of the bearings was lengthened by 50 per cent, giving them 31 times the previous average life of metal bearings.

Copper-Lead Alloys vs. Leaded Solid-Solution Bronzes for Bearings

CONFINING their attention to heavy-duty bearings, F. R. Hensel and L. M. Tichvinsky, of the research laboratories, Westinghouse Electric & Mfg. Co., discussed in their paper the metallurgical investigation of various bronze bearing metals and a comparative study of the bearing performance of those metals. The technological possibilities of producing heavy-duty bearings were investigated. Experimental installations of bearings with severe requirements are under trial.

Conclusions

Lead content and its distribution in straight Cu-Pb alloys depends primarily on the casting temperature. With lower casting temperatures, quicker solidification occurs and a larger amount of lead is retained in suspension.

Pure Cu-Pb alloys (especially sand castings) have a tendency to pro-

nounced lead segregation if the lead content exceeds 25 per cent.

Small amounts of impurities have a notable effect in retaining a good suspension of the lead in the copper. They reduce the influence of the casting temperature on the lead content and upon the distribution of lead in the casting. A further study of alloying elements acting in this direction should enable improvements to be made in the properties of Cu-Pb alloys.

Physical properties of straight Cu-Pb alloys are nearly independent of the casting temperature within a temperature range of 1050 to 1150 deg. C. They depend but slightly on the lead content within the limits of 12 to 25 per cent Pb. The Brinell hardness is the only factor that is decreased with increasing Pb content. The physical properties of straight Cu-Pb alloys have values approximately one-half of those of solid-solution bronzes of the same lead content.

Electrical conductivity of Cu-Pb alloys is about six times that of solid-solution bronzes of the same lead content or of babbitt. The conductivity is lowered considerably by small amounts of impurities, especially by P and Sn.

Performance tests of straight copper-lead alloys show that they are very suitable as bearing materials, on account of low coefficient of friction and low working temperatures. Influence of the microstructure is such that, with a finer lead distribution, somewhat better bearing performance is obtained.

Bearing temperatures during the performance tests were considerably lower with straight copper-lead bearings than with solid-solution bronzes, because of the higher thermal conductivity of the copper-lead alloys.

It is practicable to produce steel-backed copper-lead bronze or leaded bronze bearings by a centrifugal casting process. A strong joint between the steel and bearing metal can be obtained if the steel shell is at or preferably above the melting point of the bronze when it is poured into the shell. Rotational speed for a 2 to 3-in. diameter bearing should be about

1500 r.p.m. for solid-solution bronzes. Any speed between 1000 and 2000 r.p.m. may be used for straight Cu-Pb alloys.

Application of Celoron Bearings to Roll Necks

BEARINGS are made from several varieties of phenolic materials; confining his discussion to the one called "Celoron," Arthur J. Schmitt, district manager at Cleveland for the Continental Fiber Co., told of the qualifications of that type.

Suitability of celoron for roll-neck bearings has led to widespread use of the product in that field. Its resilience allows bearings to absorb severe impact loads without permanent deformation. Celoron bearings are most commonly lubricated with water, in which case the rate of wear and the power consumed in friction are much less than those of metal bearings. The application of a superior lubricant such as oil or grease improves their performance appreciably.

Celoron bearings serve most efficiently on highly polished roll necks. They have produced substantial power savings in comparison with metal bearings, and their life in numerous installations has been found many times that of metal bearings.

Manufacture and Properties of Celoron

Celoron is manufactured by impregnating sheets of woven fabric, such as linen or cotton duck, with resin, and superimposing one sheet upon another to provide the requisite thickness. Then the laminated mass is subjected to accurately controlled heat and pressure in massive hydraulic presses. The simultaneous application of heat and pressure, called curing, converts the resin and fabric into a dense, hard, tough substance, suitable for a wide variety of uses.

In hardness, celoron is about 40 Brinell. It is considerably stronger in compression than in tension, having a compressive strength of about 35,000 lb. per sq. in. and tensile strength of 17,000 lb. It is resilient as well as being hard and tough, and is often molded to final shape, although it can be machined easily. Because of its laminated structure, celoron has definite directional properties, that is, its properties at right angles to the plane of laminations are not precisely the same as those parallel to that plane.

Celoron is now often produced with an admixture of graphite, which is compounded with the resin so that its distribution is uniform throughout the material. About 5 per cent of graphite is the maximum propor-

tion which can be included in this way without impairing the strength of the material.

In numerous installations, celoron bearings carry loads ranging from 1000 to 2500 lb. per sq. in. of projected bearing area. In one installation, where the space is severely limited, a load of 5000 lb. per sq. in. is carried. Celoron bearings are resilient and are thereby able to absorb and distribute impact loads over the entire bearing area, so that excessive wear due to impact or vibration is avoided.

Average coefficient of friction of plain celoron, as determined in laboratory tests with shaft speed about 225 ft. a minute, follow:

Lubricant	—Load (Lb. per Sq. In. of Projected Bearing Area)—
Oil	1,500 0.040*
Water	2,500 0.060 0.063 0.070*
None (dry)	0.042 0.370

*Estimated.

Water-Lubricated Soft-Rubber Bearings

TWO physicists of the B. F. Goodrich Co., Akron, Ohio, told in their paper of bearings made from rubber which, under proper conditions, give low coefficients of friction. Dr. W. F. Busse and W. H. Denton were the authors.

Rubber bearings lubricated with water are found to have remarkably low coefficients of friction and to give excellent service under many conditions. The softness of the rubber makes these bearings stand up in the presence of sand and grit. It also makes the laws of lubrication governing these bearings differ from the classical laws worked out by Reynolds and others for cylindrical metal bearings.

The paper gives a comparison of the frictions of rubber and metal bearings lubricated with water at various loads and speeds. Metal bearings have the lower static coefficient of friction, but the coefficient of running friction is usually lower for rubber bearings. The difference in favor of rubber bearings increases as the load increases, provided the shaft is smooth and the load is applied after the shaft gets up to speed. Rubber bearings have been tested at loads up to 850 lb. per sq. in.

Where They Fit In

Rubber bearings are particularly suitable for use on shafts running at high speeds, not only because the friction is very low but because the softness of the rubber allows the shaft to turn on its center of gyration, even though this differs slightly from the geometrical center, thus reducing the

dynamic load in the bearing and the vibration in the machine.

These bearings have been used in deep-well pumps, turbines and many other places where water must be used as a lubricant, as well as in propeller shaft bearings in various classes of ships, and have given economical and satisfactory service. In sand washers and other places where conditions are equally severe, they have yielded service many times that of metal bearings. Under proper conditions, the coefficient of friction of soft rubber bearings compares favorably with that of the best roller bearings.

It is necessary that sufficient cooling water flow through the bearing

to keep the temperature of the lubricating film below the boiling point. Higher loads can be carried if the water is forced into the lubricating film under pressure, or if the shaft revolves at higher speeds.

Application of Tapered Roller Bearings in Merchant-Bar Mills

USING many lantern slides, S. M. Weckstein, industrial equipment engineer, Timken Roller Bearing Co., Canton, Ohio, told of the development and performance of tapered roller bearings in rolling mills and their auxiliary equipment.

In rolling metals, tapered roller bearings have made possible a considerable decrease in the consumption of power by the elimination of friction, a considerable decrease in the cost of the electrical equipment required, a decrease in the cost of lubrication and general maintenance, an increase in the speeds of operation and consequently the tonnage produced, and a marked increase in the accuracy of the product.

In this paper the experience, over a period of five years, in the proper design, mounting and operation of bearings in merchant-bar mills is discussed. Extracts are given from the results of a series of power tests made on the same mills, alternately equipped with plain bearings and tapered roller bearings.

Various means of lubrication of rolling mills, pinion stands and gear drives are cited. The design of suitable bearing closures is taken up and shown in detail.

Tapered roller bearings have been successfully applied in merchant-bar mills and have many advantages.

With them it is possible to obtain perfect alinement and accurate setting of the rolls and to maintain this setting indefinitely. This is due to the fact that the wear in the bearings is practically negligible. It is possible to make provision on the mill for adjusting devices so that the setting of the rolls can be changed by any required increment in a minimum of time. With this accurate control of the mill, a product held to close tolerances is assured.

Pinion Stands

Application of tapered roller bearings on pinion stands has kept in step with their use on the roll necks themselves. In view of the lighter loads, less capacity has been required. As a general rule, one-half of the roll-neck bearing is used on the pinion necks; in other words, where a four-row bearing is used on the roll neck, a two-row bearing is used on the pinion neck. Originally the bearings were mounted loose on the pinion necks without clamping, to allow for the float of the double-helical pinions. This type of mounting is gradually being abandoned in favor of a design in which the inner races are mounted on necks with a tight press fit. The outer races are given a loose fit in the bearing boxes, permitting them to float.

Gear Drives

With the general increase in the speed of rolling and with the further development of the continuous and semi-continuous merchant-bar mills, gear drives have been called upon to operate at much higher speeds than before. To make this practical, anti-friction bearings were installed. Tapered roller bearings have been especially desirable because of their ability to carry the thrust loads from the mills and gears.

In a series of power tests made by the General Electric Co. at the plant of the Timken Steel & Tube Co., it was possible to make comparative tests on two stands of 22-in. three-high mills equipped with plain and with Timken bearings. The tests were made while rolling 8-in. by 9-in. blooms down to 2 11/16 in. square in 15 passes, 7 passes being taken in the first stand and 8 passes in the second stand. The steel rolled was carbon 0.45, manganese 0.67, and nickel, 3.50 per cent. Table I shows the results obtained.

From these results and from other tests and study of merchant mills equipped with anti-friction bearings, a power saving is indicated of from 25 to 50 per cent, with an average saving of about 35 per cent. This means a large saving, in building a

Plain Bearings		Timken Bearings		Per Cent Saving
Roll Speed	Hphr.	Roll Speed	Hphr.	
83.5	30.653	82.5	15.800	48.5
71.0	25.001	70.2	14.888	40.5
61.0	25.874	63.2	13.362	48.3
52.0	22.806	52.7	13.546	40.6

new mill, on the cost of electrical equipment.

Open Discussion on Bearings

BEARINGS made of copper and lead must be used exclusively for low-pressure work, such as was outlined in the paper, according to Prof. W. Trinks, Carnegie Institute of Technology, Pittsburgh. He regards the dividing line at about 900 lb. to the square inch. Above that the bearings invariably smoke, regardless of the character of lubrication.

A representative of the Western Electric Co. told of his experience in the first installation of anti-friction bearings. This was in connection with a copper rod mill. He picked out the stand which was giving the greatest amount of bearing trouble, and in which there was some difficulty in maintaining both gage and alinement. In this instance the rolls were 11 in. in diameter, with an 8-in. diameter neck; they were running at 411 r.p.m. and producing a 3/16-in. oval.

Little room was found for roller bearings. Careful analysis showed that the roll necks could be reduced to 6 in. in diameter without unduly weakening the rolls, but still there was not much room left for roller bearings. Consequently this stand was changed to one with four rolls. Since its transformation it has proved to be the least troublesome of the entire train, from the operating standpoint.

In developing this stand it was at first attempted to put the bearing on the roll neck with a loose 0.005-in. fit. This did not work satisfactorily and a change was made to a tight 0.001-in. fit, which has proved thoroughly acceptable. In putting the bearing on the neck, the bearing is first assembled, then immersed in oil and heated to 300 deg. F. This expands it sufficiently so that it will slip over the neck easily.

Saving the Oil Film

Damage from over-heating of a bearing comes at the moment the heat passes from the hot shaft into the oil, according to William F. Parish, consulting lubrication engineer. Consequently efforts to take away the heat by water cooling of the bearing, or by air cooling through a hollow shaft,

do not get at the root of the trouble. However, by putting in a thoroughly good circulating system for the oil, whereby it may be cooled, the trouble is largely done away with. This obviates breaking down the factor of safety of the oil and solves the problem.

Mr. Weckstein explained, in response to a question, that the Timken bearings are made either of a nickel-molybdenum steel containing about 1½ per cent nickel or of a nickel Krupp steel containing from 3½ to 4½ per cent nickel. It is necessary to use a carburizing steel which will have enough hardness in the case-hardened part, and yet have enough resilience in the backing-up section to take care of the heavy loads.

In rolling thin strip brass, with a tolerance down to 0.00025 in., Walter R. Clark, works manager, Bridgeport Brass Co., Bridgeport, Conn., uses roller bearings on a cluster mill. These bearings are mounted on taper sleeves forced on the roll necks. In grinding the rolls for this exceedingly close work, the bearings are first placed on the necks and then used as bearings on which to grind. This results in getting the face of the roll concentric with the bearings. Previous experience with the bearings loose on the sleeves gave trouble in obtaining the gage tolerance required. It was found necessary to have the bearings tight on the necks, so that the whole thing operates as a unit.

Conflicting Views on Lignum-Vitæ

Speaking from the steel mill standpoint, S. F. Markell reported finding lignum-vitæ bearings and phenol bearings of the celoron type very successful in replacing the ordinary brass and bronze bearings. They give good accuracy in rolling, in places where there is insufficient room for roller bearings. Both of these types, however, need plenty of water to avoid over-heating. He reported getting as much as 1000 mill-hours in the life of the bearings, with pressures estimated above 5000 lb. to the square inch. Some failures were reported in these bearings, and their design is being improved to overcome this.

One speaker reported putting in lignum-vitæ bearings in contrast with babbitt bearings and comparing the operating methods of the two. He found that, after 95 days of operation and 6000 tons of product, the lignum-vitæ bearings were completely worn out, while the babbitt bearings still had considerable life left in them. Inasmuch as the lignum-vitæ bearings cost about 10 times as much as the babbitt bearings, he did not pursue the experiment further.

National Unity Needed to Cope with Present Economic Crisis

By GEORGE M. VERITY

Chairman, American Rolling Mill Co.,
Middletown, Ohio

I AM always appalled by the lack of seeming responsibility to a national administration on the part of so many of our substantial citizens, and at the further fact that they apparently expect such impossible things to be done without even the benefit of their sympathy and support.

In time of great storm at sea even the most powerful and seaworthy of vessels must go through certain excruciating experiences.

The commander is on the bridge, baring his head and person to the storm. He must keep the ship headed right into the teeth of the storm, but he cannot allay or lessen it. He and the ship must take just what comes.

Great waves are washing the decks and down below disorder prevails. Staunch portholes are crushed and water pours in. Disorder prevails, but the passengers know that the commander is on the bridge, that under his guidance the ship will continue to press right into the storm, and that it will ride it out. No call is made for a new commander, no demands are made that he stop the storm and allay the disorder, because they know that it is humanly impossible.

Is it not just as ridiculous for a great nation, in time of a great economic, political and social storm, to expect the commander-in-chief to stop it and to check the damage being incurred before the storm has run its course?

All he can do is to steer a straight course, to pour on the troubled waters the oil of broadened national credits, of confidence in the nation's strength, of assistance to the needy, of help in the reconstruction needed at home and abroad whenever and wherever possible.

In this great crisis we have as a commander-in-chief a man of unimpeachable character, a man of great heart, full of human sympathy, an able man who understands the intricacies and complexities of economics as few do, a man who knows the problems of commerce and industry, a man who is familiar with the world situation, a man of indomitable energy. He is not a superman; there are none such, but what more could we hope to have in a commander?

His one great lack is the full sympathy and support of all the other chosen representatives of the people and of a large enough group of our great citizenship itself which represents public opinion.

Is it fair to the commander, is it fair to the nation, is it fair to ourselves and to those who will come after us?

Let us get behind the commander and we will be surprised how quickly we can get back to more normal times and to a greater individual happiness.

The outstanding national and international events of the past summer, beginning with President Hoover's moratorium and followed by the various conferences between the chief executives of nations of Europe, the German election supporting the present government, the English election,

President Hoover's various plans for broadening and strengthening the credit structures of the nation, the improvement in wheat and cotton, have all contributed to the building of a new foundation under our whole economic structure.

These were all fundamental things which had to be done before world confidence would be restored.

A clearer understanding of the interdependence of nations has developed a new spirit of cooperation among the leaders of nations. This has been largely, if not solely, due to the policies inaugurated by the Administration at Washington to meet the new and unusual world conditions that have existed.

We are working toward complete recovery and it will be enjoyed at the earliest possible date consistent with the large and complex situation which confronts us, if the people of this nation, irrespective of party, will but give their administration at Washington the wholehearted support which every national administration must have in time of great crisis.

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Lukens Steel Co. Founds Industrial Fellowship

Dr. Edward R. Weidlein, director, Mellon Institute of Industrial Research, Pittsburgh, has announced that the Lukens Steel Co., Coatesville, Pa., has established in the institute an industrial fellowship whose purpose is the scientific investigation of processes employed in the manufacture of steel plates.

Erle G. Hill, who received his professional education at the University of California, has been appointed to the incumbency of this fellowship. He is a specialist in iron and steel technology, and was previously associate professor of metallurgy in the School of Mines of the University of Pittsburgh.

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Protective Coatings for Aluminum Alloys

The Bureau of Standards has been studying the efficiency of the various means now being used to protect the high-strength aluminum alloys, which are so important in the aircraft industry, against corrosion. Three types of coating for accomplishing this are in use. These are the oxide, the metallic and the organic type of protective coating.

The results of this investigation were obtained by the salt spray, intermittent immersion, and weather exposure tests. A 20 per cent sodium chloride solution was used in the salt spray. A nine-parts normal sodium chloride and one part hydrogen peroxide solution was used as a corroding

medium for the intermittent immersion. In this test the specimens were corroded in the static and flexural stressed condition as well as the unstressed condition.

Both laboratory and weather exposure tests indicated that aluminum-pigmented spar varnish applied on an anodized surface afforded protection against corrosion for an appreciable period under severe conditions.

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Schwab Predicts Greater Era of Prosperity

"I am just as confident as ever that we will ultimately emerge to a period of prosperity and happiness as great, if not greater, than any we have ever seen," declared Charles M. Schwab, chairman, Bethlehem Steel Corp., at the annual dinner of the Pennsylvania Society Dec. 19 at the Waldorf-Astoria, New York. He stated further that the depression is permeating every class of society, and added that in recent months he had had worries and responsibilities such as he never expected to have.

"The laws that have ruled commerce will not be changed," said Mr. Schwab. "The law of supply and demand is that which is going to regulate depressions as well as prosperity. We must fight through this depression."

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Mueller Brass Co., Port Huron, Mich., for the fiscal year ended Nov. 28, reports an increase of 296 per cent in its sales of streamline copper pipe and fittings, compared with last year.

Reconstruction Finance Corporation Strongly Urged at Congress Hearings

WASHINGTON, Dec. 22.—With President Hoover pressing for action on his domestic business reconstruction program, Congress has prepared to take up the more important measures when it re-assembles, Jan. 4, after its Christmas recess. The first to be taken up is the Strong-Walcott Reconstruction Finance Corporation bill. That this, and at least some of the other administration emergency measures, will receive non-partisan support was made clear at White House conferences with leaders of both parties.

The President has declared the Reconstruction Finance Corporation bill to be "most urgent." Help for the railroads is one purpose of the measure, and the President stated that he expected the corporation would be "able to give emergency aid in this situation if it be necessary." It does, however, have other far reaching provisions, and Eugene Meyer, Governor of the Federal Reserve Board, told the House Committee on Banking that he thought the bill would restore confidence in many areas. He declared that, "fears and uncertainties are the dominant factors in the difficult credit situation today."

The bill proposes a \$500,000,000

corporation, the capital to be furnished by the government, and it would be authorized to issue bonds not exceeding \$1,500,000,000. The corporation would be empowered to make loans to banking institutions, building and loan associations, insurance companies or other financial associations and to railroads. The corporation would be managed by a board of directors consisting of the Secretary of the Treasury, the Governor of the Federal Reserve Board, the Farm Loan Commissioner and two other persons appointed by the President.

It would have succession for a period of 10 years unless dissolved by Congress. The bill was strongly supported at hearings before both the House Committee on Banking and a subcommittee of the Senate Committee on Banking and Currency.

"Would Allay Fear and Timidity"

As one of the chief spokesmen for the administration, especial attention was given to the testimony of Governor Meyer of the Federal Reserve Board, who summarized the importance of the measure when he told the House committee that a tremendous volume of national assets are frozen

"by nothing but fear and timidity," and that the great need of the reconstruction bill is to "allay misgivings over the liquidity of sound investments."

The desire of the President to have early action on the reconstruction bill is believed to have been stimulated by disturbing telegrams received by the White House regarding bear raids. These messages indicated an alarm, which the President apparently desired to allay through a statement he issued telling holders of American railroad securities that the prevailing credit situation of the carriers continues to receive the "most serious attention" of the administration. The value of these securities has been placed at \$11,000,000,000, although it was not stated in the announcement made by the President. The President said that the new Railroad Credit Corporation is already negotiating for funds to make loans to the weak lines and a plea was made for further help through prompt action by Congress on the reconstruction bill. The President pointed out, however, that late reports from the Interstate Commerce Commission show only 16 or 17 per cent of the carriers are

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WHAT CONGRESS HAS DONE OF INTEREST TO BUSINESS

RECONSTRUCTION FINANCE CORPORATION BILL—Congress agrees to take up this major measure of administration for speedy action immediately after holiday recess.

FARM LAND BANK BILL—House passes bill increasing capitalization of land banks by \$100,000,000, as recommended by administration.

NAVAL APPROPRIATION—Chairman Vinson of House Committee on Naval Affairs expects nonpartisan support of bill appropriating about \$760,000,000 for new ships to be built during next 10 or 15 years. Hearings during Christmas recess. Fred A. Britten, former chairman of committee, introduces bill to make blanket appropriation authorizing construction necessary to make American navy as big as permitted by treaties. Similar bill

introduced in Senate by Chairman Hale of Senate Committee on Naval Affairs.

TAXATION—House Committee on Ways and Means probably will begin hearings soon after holiday recess.

MORATORIUM—House ratifies administration moratorium with section opposing cancellation or further scaling of Euro-

pean post-war debts. Senate Finance Committee conducted hearing on bill at which bankers testified on floating of foreign securities in the United States.

NATIONAL ECONOMIC COUNCIL—Hearings ended on LaFollette bill for long range planning. Senator LaFollette announced measure will be given early consideration by Committee on Manufactures previous to seeking its passage.

WORLD COURT—Senate Committee on Foreign Relations votes not to take up protocol for American adherence to World Court until after domestic problems have been settled.

WHEAT SURPLUS—Senate Committee on Agriculture approves bill authorizing Federal Farm Board to give 40,000,000 bushels of wheat to feed the unemployed.



Recent Commercial Developments in Unburned Magnesite Brick

THE great promise of unburned magnesite brick, based on both laboratory and commercial experiences of the General Refractories Co., Philadelphia, was told at length in *Mining and Metallurgy* for December by A. E. Fitzgerald, ceramic engineer of the company. Preliminary investigations showed that the individual grains of magnesite in the unburned brick did not fit closely enough, and excessive void spaces remained between them. When sintering took place in service, the grains moved closer together and the voids closed, but the brick shrunk in size.

Three improvements in the art of pressing magnesite brick were developed. First, the pressure under which the bricks were formed was increased tenfold, from 1000 lb. to 10,000 lb. per sq. in. This greatly reduced the amount of void space between the magnesite grains. Second, the interfitting of the grains was developed to a maximum by proper gradation of the sizes of the individual magnesite particles. Third, a colloidal coating for the magnesite particles was prepared, which acted as a lubricant between the particles, causing them to interfit better under the forming pressure. The three improvements combined solved the problem of shrinkage in the unburned brick and also solved the problem of maintaining the strength of the unburned brick at all temperatures.

After the laboratory development the new improvements were translated into full-scale plant production. To obtain the high forming pressure for the unburned brick, a special 800-ton hydraulic press was constructed. It was a combined mechanical-hydraulic press capable of making eight pressing operations a minute, each operation producing four 9-in. bricks under the required pressure of 10,000 lb. per sq. in.

New equipment for obtaining the properly sized magnesite grains was also designed. Special screening was necessary to select the desired grain sizes; these sizes were then combined in the ratios prescribed by the laboratory. The complete operation of grinding the magnesite, screening and tempering it with water, and pressing and drying the brick was then begun on a commercial scale, but under strict laboratory control.

Then the commercial unburned bricks were tested to compare them with commercial burned brick. First, the freedom from shrinkage in the unburned brick was tested. For this purpose representative lots of burned and unburned brick were placed side by side in kilns engaged in the burning of magnesite brick. These kilns are regularly brought to a tempera-

ture of 2700 deg. F. They are under fire for approximately eleven days for a single campaign. The test lots were allowed to remain in the kilns for four campaigns, whereupon the linear shrinkage of the bricks was measured. It was found that the burned brick had shrunk by 1.38 per cent while the unburned had shrunk but 1.02 per cent.

Comparative tests were made on the cold crushing-strength of the respective bricks, as determined by applying static loads to the $4\frac{1}{2}$ by $2\frac{1}{2}$ -in. faces of regular 9-in. brick. Average determinations for burned brick gave a crushing strength of 7094 lb. per sq. in.; for unburned brick, 8127 lb. per sq. in.

The strength of the unburned brick was further tested by a rattler test similar to a test used for paving bricks. It was found that burned brick under these conditions lost by abrasion approximately 38.2 per cent of their weight, whereas the unburned brick lost 33.44 per cent.

The properties of these bricks were then compared at high temperatures. Representative tests were made under static loads of 28 lb. per sq. in. In high-temperature furnaces, similar to the standard German load testing furnaces, the samples were submitted to increasing temperatures and the point at which they started to deform under the static load was noted, also the point at which shearing took place. For the burned brick the first deformation occurred at 2725 deg. F., and for the unburned at 2860 deg. F. The burned brick sheared at 2763 deg. F.; the unburned at 2940 deg. F.

The unburned and burned brick were then compared for their resistance to spalling. Representative lots of 9-in. straight brick were subjected to an air spalling test from 1000 deg. C. They were heated for one hour on their $4\frac{1}{2}$ by $2\frac{1}{2}$ -in. face in the doorway of a furnace maintained at 1000 deg. C. The heated bricks were removed and cooled in the air for 30 min. and then replaced in the hot furnaces. This heating and cooling was repeated until 20 cycles had been run. The burned brick lost on an average 48.9 per cent of their original weight in 20 cycles, while the unburned brick suffered no loss in the same 20 cycles.

The two kinds of brick were next tested for their permeability to gases under pressure. A comparative test was made by noting the time required to pass 1000 cc. of air through a $2\frac{1}{2}$ -in. thickness of the brick. For the burned brick $2\frac{1}{2}$ sec. were sufficient, whereas for the unburned brick 150 sec. were necessary. These tests were taken to indicate that the unburned brick would permit less gas

leakage in a given furnace wall than the burned brick.

Mr. Fitzgerald pointed out how the cost of manufacture was relatively very low, partly owing to the elimination of the 14 days required for burning, and discussed the product from several angles in respect to its practicality. Its application in steel making, for lining of mixers, in copper smelting, and in the Portland cement and pulp and paper industries was considered at length. An open-hearth plant, he said, saved \$5,000 a year in front and backwall repairs alone through the use of the unburned brick.

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Says Scrap Trade Must Face Changed Conditions

Dealers in iron and steel scrap were urged to adjust themselves to changed competitive conditions, which they will have to face in the next period of business revival, in an address by Benjamin Schwartz, director general, Institute of Scrap Iron and Steel, before the Cincinnati chapter of the institute on Dec. 14. Mr. Schwartz predicted that domestic consumption of scrap by the iron and steel industry within the next three years will exceed 40,000,000 tons annually and that the export of scrap will approximate 750,000 tons a year.

He said that there will be closer cooperative marketing arrangements, both regionally and nationally, between dealers, producers and consumers, to eliminate wasteful competition, such as cross-hauling of scrap, to minimize the element of speculation and to stabilize the supply, quality and price of scrap. He predicted that an export association will be formed under the Webb-Pomerene law to develop world markets for American scrap and that the development of new waterways in this country will make many changes in domestic distribution. Waterway movement of scrap has already shifted some markets.

"The day when profits could be made by waiting for wide fluctuations in the price of scrap are past," said Mr. Schwartz. "Merchandising lessons must be learned by many dealers if they wish to protect the small margin of profit which will be their share tomorrow. The days when dealers could make profit out of large tonnages of mixed scrap from producers are also past; the producers have learned to segregate and classify their items, have learned to prepare the scrap at low operating cost through the use of modern machinery. To meet these conditions many scrap dealers will have to learn their costs and modernize their equipment. This situation has given rise to the development of scrap specialists among dealers, and a knowledge of metallurgy will not be an unusual characteristic of the scrap dealer of the future."



Ford Program Continues Center of Interest at Detroit

DETROIT, Dec. 21. **W**HAT Mr. Ford intends to do, now that he has switched away from his earlier plans, remains almost the sole topic of discussion in automotive circles. The fact that he will build an eight-cylinder car with a V-type motor seems well established and it is reasonable to believe that he will sell it at a price not far distant from the current model A. The time when he will be in production is less certain. It is pointed out that he cannot possibly tool up for an eight in 30 to 45 days and that the chance of his getting started on a volume basis by the middle of January is slim. Frankly, no one knows, except perhaps Mr. Ford himself, just when the new models will be under way, but there is a growing opinion that it will not be much before Feb. 1.

The revamping of the Ford program is responsible, of course, for the series of delays in awarding first quarter steel contracts at Dearborn. The steel people have not been the only sufferers from the disarrangement of Ford plans, as many suppliers who expected to get releases in time to start operations the middle of this month have been disappointed. Murray Corp., for example, has been compelled to postpone the manufacture of new Ford bodies until early in January. Steel companies have been disappointed so many times in regard to the placing of the Ford tonnage that they no longer are venturing an opinion about a definite date when they will get this business.

It is understood that when an abrupt about-face was made at Dearborn, engines and axles as well as other parts for the new four-cylinder car were being produced in small quantities at the Rouge plant. A considerable number of tool designers were reengaged and they now are working at full speed to carry out

The Ford Motor Co. has scrapped over 60,000 cars at Rouge since establishing early in 1930 its plan for disposing of old cars.

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All bodies formerly manufactured in the United States for Buick's Canadian cars are now being produced in the Oshawa, Ont., plant of General Motors of Canada.

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General Motors Truck Co. is supplying completely remanufactured engines as replacements for truck engines needing overhauling or major repairs, thus saving truck operators the loss of time during which their vehicles normally would be out of service.

* * *

Dodge Brothers, Inc., has developed a valve seat insert of high-speed tool steel which eliminates eroding and burning exhaust valves. This valve seat, in combination with a steel exhaust valve and a high-nickel, cast iron valve stem guide, gives upward of 50,000 miles of service without valve adjustments or valve grinding. The exhaust valve life probably is as great as the cylinder block itself.

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Mr. Ford's recent changed program. In the past year the Chevrolet six has outsold the Ford four in the passenger car field and it is not surprising that Mr. Ford is said to be preparing an eight in an endeavor to outsmart his competitor and win back the leadership which, except for a brief lapse in 1927, he held for many years prior

to 1931. However, it is not believed likely that he will completely abandon the four-cylinder field. There still remains a potential market for about 750,000 fours a year, especially among fleet owners who count every fraction of a cent in considering the purchase price and maintenance costs of their units. Moreover, the depression, with reduced incomes on the part of almost every one, is thought in automotive circles to have created a demand for a lower-priced car than any now on the market. During the so-called "new economic era," even Mr. Ford found it advisable to offer a much better car than formerly, although he had to sell it considerably above the level of model T. Will Mr. Ford reclaim this lower-priced field which he abandoned and into which no one else has ventured?

With Ford contributing little, if anything, to the month's output, December is not expected to pass the 100,000 mark. Most factories are getting into production so gradually that their increased activity will be reflected only slightly in this month's total. No one is ready to make a prediction about January, except to say that it will show some gain over December. The truth is that the industry is marking time and intends to proceed cautiously during the winter months. By the middle of February it will know the results of the New York and Chicago national shows and of the local shows held in other cities. It will be able by then to discern whether business is really displaying signs of getting out of the bog in which it finds itself today. So far as employment is concerned, local automobile plants have been taking back a considerable number of men. However, the gain has been offset in large measure by the men thrown out of work by the ending of the Lake navigation season and of considerable

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Bullard Co. Announces Executive Changes

E. P. Bullard, president, Bullard Co., Bridgeport, Conn., has announced changes in the executive organization of the company, including the election of D. B. Bullard, J. W. Bray and L. S. Horner, a new member of the organization, as a group of vice-presidents in charge of engineering, sales and business promotion, respectively. Mr. Bullard was mechanical engineer and Mr. Bray was sales manager.

The changes are made in anticipation of a turn toward improvement in business conditions indicated from the current negotiations of the company, and are preliminary to the announcement of an improved line of machine tool equipment to be presented to the trade the first of the year.

E. C. Bullard retains the position of vice-president and general manager, to which he was appointed early in the year. E. P. Blanchard is appointed sales manager.

L. S. Horner, the new member of the official group, joins the Bullard Co. with a background of 25 years of manufacturing experience in New England. He was prominently connected with and responsible for the progressive campaign and the development of a sizable volume in new products for the Acme Wire Co., New Haven, Conn., and was later president of the Niles-Bement-Pond Co. in the reorganization and consolidation of its various allied operations, and later in the segregation of certain of their unrelated units for more economical operation.

As a lieutenant-colonel in the United States Army Air Service, he rendered a service of assistance in the organization and development of the wartime aviation program. Later as a



COL. L. S. HORNER

director of the United States Chamber of Commerce and other national organizations, he has kept in touch with the broader phases of national and international trade and industrial conditions.

Mr. Horner is a director of the Niles-Bement-Pond Co., the Crocker-Wheeler Electrical Mfg. Co., the Acme Wire Co., the Burden Iron Co., and the Truett Corp., and is a member of the American Institute of Electrical Engineers, the Electrical Manufacturers' Club and the Ordnance Association, as well as the New Haven Chamber of Commerce and the United States Chamber of Commerce, wherein he is active in various committee work. His present home is in New Haven, Conn.

Greater Stability in Labor Turnover

A sharp drop in separations from industrial employment in November, compared with October, accompanied by a substantial increase in accessions to the payroll, brought the separations and accessions close together. November separations reported by the United States Bureau of Labor Statistics at 3.92 per cent of the number on payroll, compared with accessions of 3.63 per cent, leaving the net reduction of employment at 0.29 per cent, compared with a net reduction in October of 3.47 per cent, or approximately 12 times as great.

Accessions exceeded separations in slaughtering and meat packing and in the automobile industry, being so great in the latter case as almost to over-balance the excess of separations in the eight other industries reported upon. Accessions in automobiles were

16.51 in November, compared with only 4.23 in October, and separations at 7.48 were less than one-half the accessions, whereas in October separations at 20.61 were almost five times the accessions.

In iron and steel both separations and accessions increased slightly compared with October, leaving a net decline of 0.72 per cent in number employed. Accessions were 1.78 and separations 2.50. In foundries and machine shops both accessions and separations declined in November from October, and by about the same amount, leaving the net loss at 2.51 per cent compared with 2.81 per cent in October.

International Steel Co. is the new name recently adopted by the International Steel & Iron Co., Evansville, Ind. F. O. Weber, president, has announced that there will be no change in policy or management personnel.

Further Decline in Wholesale Prices

Commodity prices in November showed a fractional decline from October, continuing the movement which has been almost uninterrupted for more than two years. According to the Bureau of Labor Statistics compilation, the average in November was 68.3, compared with 68.4 in October and with 80.4 in November, 1930.

Nearly all of the major groups of commodities showed fractional declines; only in foods was the decline more than one point. Partially offsetting this was a fractional increase in chemicals and drugs, and a substantial increase in fuels and lighting materials.

Metals and metal products dropped from 86.5 in October to 86.2 in November, compared with 90.2 in November, 1930. Iron and steel, non-ferrous metals, agricultural implements and automobiles participated in this drop. The item "other metal products" was unchanged.

Taking the great groups, raw materials showed an increase from 61.5 to 62, semi-manufactured a decline from 64.7 to 64.4 and finished products a decline from 73.7 to 73.2. These changes connoted an approach to greater uniformity as between raw materials and finished products. All figures are related to 100 as the average of 1926.

Mesabi Range Shipped 65 Per Cent of Ore

The Mesabi Range maintained its position in the iron ore industry by shipping 65 per cent of the total amount that was shipped by water during the year, or the same percentage that came from that range in 1930, according to the annual report of the Lake Superior Iron Ore Association. The Marquette Range took third place in water shipments, crowding the Menominee district back to fourth place. The relative position of other ranges based on water shipments was the same as in 1930. Total shipments by ranges and grades were:

Total by Ranges	
Mesabi	15,219,155
Gogebie	2,879,091
Marquette	1,750,499
Menominee	1,447,767
Cuyuna	807,436
Vermilion	1,129,189
Grand total	23,233,137
Total by Grades	
Bessemer	6,266,647
Non-Bessemer	15,628,611
Manganiferous	714,434
Aluminiferous	298,996
Silicious	324,449
Grand total	23,233,137

PERSONALS

HOBART S. JOHNSON, vice-president, Gisholt Machine Co., Madison, Wis., has been elected president to fill the vacancy caused by the death of his brother, Carl A. Johnson. Three new vice-presidents have been elected, namely, FRED W. COOMBS, GEORGE JOHNSON and CHARLES H. JOHNSON. G. E. Gernon continues as secretary, and M. I. Johnson as treasurer.

JOHN E. BARKLE has been appointed general manager of the South Philadelphia works, Westinghouse Electric & Mfg. Co. Since 1929 he has served as works manager at that plant. Mr. Barkle was graduated from Dickinson College in 1901 and immediately became associated with the Westinghouse company. After filling a number of positions in the works department, he was made superintendent of the factory which the company had erected at Pittsburgh for the manufacture of munitions, and later was in charge of erection activity on electric locomotives which were delivered to the Chicago, Milwaukee & St. Paul Railroad in 1919. With the completion of this job he was placed in charge of all district service shops as general superintendent, and in 1926 became superintendent of manufacturing of all generating apparatus at East Pittsburgh.

EDWIN G. JONES, for six years general superintendent, Inland Steel Co. of Wisconsin, has been transferred to the Chicago offices of the company, following the closing of the Milwaukee sheet mills for an indefinite period. Mr. Jones will assume new duties Jan. 1 in the inspection and metallurgical department.

JOSEPH VIALI, district manager, Steel Sales Corp., at Milwaukee, has been elected president. Sales Managers' Association of Milwaukee.

GEORGE JONES has been appointed master mechanic at Joliet works, Illinois Steel Co., succeeding JAMES A. BELL, who retired on a pension Dec. 1. Mr. Jones has been assistant master mechanic for many years.

S. S. PORTER, vice-president, Calumet Steel Co., has been elected to the board of directors of the Illinois Manufacturers' Association.

D. W. DEAN, who has recently been identified with the steel mill section, general engineering department, of the Westinghouse Electric & Mfg. Co., East Pittsburgh, has been appointed manager of the control section of the company's industrial department, succeeding the late W. H. MacGillvray. Mr. Dean was graduated from Ohio State University in 1921 and entered

the Westinghouse student training course in 1922, following a brief period in the electrical department of the Buckeye Steel Castings Co., Columbus. He has been active in the Westinghouse engineering department since that time and has been granted numerous patents on synchronizing roll table speeds, flying shear control and methods of maintaining tension between stands on tandem mills. He has also carried on considerable work on cold strip mills, reel drives and auxiliary drives.

FRANK J. THRALL, who has been engaged in the buying and selling of sheet steel, has become identified with the sales division of the Marks Perry Steel Corp., Detroit.

C. A. ANDERSON and R. C. BLAIR have been appointed general manager and assistant sales manager respectively of the Wright Mfg. Co., Bridgeport, Conn. They will make their headquarters at York, Pa.

CARL J. LAMB, formerly identified with the Westinghouse Electric & Mfg. Co., has been appointed New

York district manager of the Sharples Specialty Co., Philadelphia.

JAMES LOVETT, heretofore of the Koppers Co., Pittsburgh, has been made general manager of the Hamilton Coke & Iron Co. He takes the place of JOHN T. WHITING, who has resigned to accept a position with the Alan Wood Steel Co., Philadelphia, on Jan. 1.

AMBROSE SWASEY, chairman of the board of the Warner & Swasey Co., Cleveland, and one of the founders of that company celebrated his 85th birthday at a luncheon given Dec. 19 by the officers of the Chamber of Commerce of that city. There were 90 leading citizens present. The function was also the occasion for a preview of a portrait of Mr. Swasey that will be officially hung during the chamber's annual meeting in April. Mr. Swasey served as a president of the chamber and his portrait will be included in a group of portraits of ex-presidents.

WILLIAM G. MATHER, president, Cleveland Cliffs Iron Co., and Corrigan, McKinney Steel Co., Cleveland, has been elected a director of the American Council for St. Luke's International Medical Center, Tokio, Japan, taking the place made vacant by the recent death of his brother, Samuel Mather.

OBITUARY

FREDERICK S. JORDAN, sales manager of the nickel department of the International Nickel Co., Inc., New York, died of a cerebral hemorrhage at his home in New York on Dec. 16, aged 63 years. He began his business career at the age of 18 in the Cleveland office of the Big Four Railroad. A year later he became identified with

the Canadian Copper Co. When this company was merged into the International Nickel Co. in 1902, Mr. Jordan moved to New York as a sales executive. He had been associated with the company continuously since that time.

JOHN N. CAREY, for several years president of the former Bollinger-Andrews Construction Co., Verona, Pa., died on Dec. 14 at his home at Oakmont, Pa. He was born at Pittsburgh in 1864, and was graduated from Holy Ghost College, now Duquesne University, in 1884. He was first employed as a draftsman with the Carnegie Steel Co., but went with the Bollinger-Andrews company in 1909 as chief engineer. He later became president and served in that position until his retirement in 1925.

FRANK B. ROBINSON, organizer and former president of the Carbon Steel Co. of Pittsburgh, died suddenly of a heart attack at the Engineers' Club in New York on Dec. 18, aged 76 years.

J. W. SCHATZ, president of the Federal Bearings Co., West Poughkeepsie, N. Y., met his death at the hands of an assassin at his home in Poughkeepsie on Dec. 20, aged 56 years. He was vice-president of the Schatz Mfg. Co. and of the Waterbury Steel Ball Co., Waterbury, Conn.



F. S. JORDAN

Needed, a New Congressional Temper

EVEN the short time the new House at Washington has been in session has shown some sobering effects of the shifting of responsibility for power. How far apart are the language of political attack and the speech which public men must employ when called upon to initiate policies and win a suffering and none too patient people to the support of their proposals! We are seeing also with what difficulty those who long have taken the role of insurgency adjust themselves to the vocabulary of constructive legislation.

Breathing out threatenings and slaughter is so largely a matter of lungs and larynx and makes small call on brains and vision.

Nothing in the recent publication of Woodrow Wilson's early White House experiences was more significant than the chapter dealing with the metamorphosis of William Jennings Byran, radical and bitter assailant of the party in power, to the Bryan who as occupant of the chief cabinet seat was called on to reverse the attitude and utterance of his whole fiery career. In these coming months we shall hope to see the like process at work in some of his outstanding successors at Washington.

We are not concerned here with the partisan phase of the new situation. Typical of a flood of comment on it is the *New York Times's* suggestion that "the first break of good fortune President Hoover has had" was the capture of the House by his political opponents in such a time as this. Those who had been laying in ammunition for a continuous offensive now find themselves on the defensive. The majority in the House must originate revenue legislation. Facing an enormous deficit, created by the hilarious bi-partisan plunderbund of the last Congress, those who have decried tax increases must now add to the people's burdens. They must decide that these are to pay more while those are to be let off lightly. Unfortunately too many of these decisions will be made in the light of consequences to be faced in the Presidential campaign of 1932.

Thus far the sobering effect of responsibility in the present crisis has been offset by humiliating outbreaks in Congressional debate. There have been those in both parties who have seemed to vie in effort to thwart and discredit the President. Never has an American Congress faced problems of such grave import to the nation and to the world. At home and abroad distressed peoples are centering their hopes on Washington for relief from intolerable burdens. Never has there been such need of

suppressing party spirit and political enmities. Congressmen who have been so quick to strike fire must be made to see that they are but fanning the war spirit and that agreement and relief will never come that way.

We can only hope that the first days of the new Congress will prove to have been its worst and that conciliation and a desire for agreement may soon replace rancor and obstruction. The fateful combination of events that has brought so narrow a balance of power should of itself restrain passion and deepen the obligation to work for unity. Well for the country if the Congressional mind can catch the spirit that has led constituencies back at home to fill their community chests to overflowing and united men of every sort and condition in work for the common good.

Confidence in Ourselves

THE wealth of the American people in physical things remains substantially unchanged from what it was in 1929, may even have increased somewhat. We have added to our housing and to our public services. We have made extensive additions to transportation plant in the way of pipe lines for natural gas and gasoline. On the other hand we have allowed existing possessions to run down by neglect of proper upkeep and we have also diminished our inventory of goods in stock. We are unable yet to evaluate such credits and debits, but a reasonable conjecture is that they may be more or less offsetting. If we should lose all of our foreign investments we should write off only 3 or 4 per cent of our total wealth.

Likewise our total foreign trade is only a small proportion of our domestic. Our imports and exports run normally about three billion dollars a year each way, but our national income which is mainly expended at home aggregates about 84 billion. If we did not do any foreign business we should still have an enormous internal turnover.

Calm consideration of these conditions should dispel the fear that if there should be a complete collapse of Europe the ruin would extend to the United States and reduce us to a state of barbarism. How could that be, with our wealth of food, fuel, clothing and shelter? It is, however, such fear that has produced the paralysis of credit from which we are suffering. Our gold constitutes only about 1 per cent of our national wealth. Our currency which rests partly on gold and partly on the credit of our government, which stands unimpaired, is scarcely

more than 2 per cent. Any attempt to liquidate all of our wealth into either gold or currency is an impossibility. Likewise is any attempt to liquidate the whole of our normal internal indebtedness.

It is such an attempt to do the impossible that has produced the present paralysis of credit; and the more it has been essayed the worse it has become. It is this that the President correctly aims to relieve by the several measures that he has recently recommended to Congress. There is no other way out of the blockade into which we have worked ourselves. The most important of the President's recommendations imitates the War Finance Corporation that operated successfully in 1921. This is not, therefore, experimental, and Congress should not hesitate to provide for it.

The matter of the short term German debts is not fundamental to American business. Nor is the whole subject of reparations and national debts. The chances are that the commercial debts will be settled sooner or later and after all it is the bankers' business to lend money. The apprehension in respect to our gold position, absurd in its development at a time when we were being blamed for having too much gold, has disappeared. Our own foolish hoarding of currency is waning. What we need to do is to attend to our own affairs and we pray that Congress will so direct itself, heeding the advice of the President, which is sound and sober and unsensational. The first step toward the rehabilitation of American business is the revival of confidence in ourselves.

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Railroad Receivers Able to Buy

WHEN railroad bonds are selling at yields more than double those on short term borrowings of the United States Government it is evident that receiverships are in prospect and it is not alarmist talk to discuss what would probably occur in business in such eventualities. The reference to high yields is based on a computation involving merely the interest rates. There is no inclusion of the enormous yields some bonds would show by the conventional computation of assuming regular interest payments and then payment of face at maturity, for some bonds maturing within the next three years are selling at far below face. In such cases the market indicates that it is not expected that the bonds will be paid, i.e., that regular and ordinary refunding operations will be possible. In those cases reorganization, preceded by receivership, is indicated with particular plainness.

From the viewpoint of steel the matter of not a few railroads being in receivership may as well be considered. There has been virtually no railroad buying for improvement purposes for a long time, and it is doubtful whether on an average the railroads have been making all the purchases for mere operation and upkeep that even the present conditions and prospects as to traffic would really require. In fear of a receivership and hoping to tide over somehow until better times possibly arrive, a rail-

road management will be unduly niggardly in its purchases.

When the receivership actually comes the case is different. The receivers are allowed to make all the purchases necessary to operate the road, and in addition the courts allow them to make such improvements as can be shown to be justifiable, to enhance the road's earning ability. The improvements may even be quite extensive.

As there has been virtually no railroad buying of late, and selected railroad bonds have been making new lows more often than not on the trading days since the first of the month, promising no relief in present circumstances, the steel industry has nothing to lose in railroad tonnage and something to gain in case of receiverships.

These railroads are necessary and cannot be allowed to cease functioning. They will be kept functioning by this means or that means. A railroad in straits must bear its burden itself of paying fixed charges out of such income as it has. When there is receivership or reorganization the burden is shifted from the railroad management to the holders of the securities. The loss, sad as it is, then falls on them but the railroad itself can go ahead, making necessary repairs and making such improvements as will be helpful to improve the earning power.

Railroads are not going to be put out of business by other modes of transportation, and they should be improved continuously both to take care of traffic and to become more efficient. So far as costs and physical conditions go a depression furnishes the best time for such work, only financing being a barrier, and receiverships and reorganizations pave the way for that. Railroad demand for steel cannot decrease from its recent level and some time it is going to increase.

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Costs When Demand Is Light

MUCH has been heard lately about manufacturers cutting their costs with an assiduity never before seen. One might get an impression that the idea, or at least the practice, of cutting costs is new, but memory is quite to the contrary. Especially since 1920 every year has seen a strong effort to effect economies. In that particular year alone the effort seemed to be to swell costs. Manufacturers paid bonuses to workmen, getting them away from competitors, and paid fancy prices for materials with the idea of recouping by securing premiums on early deliveries of their products. There were seven years of great activity until late 1929, and it is only necessary to recall the talk of "profitless prosperity" over much of this period to point out that cost reduction was being dictated in no uncertain terms.

Current efforts in this direction pertain more to recent costs, which have mounted on account of light operation and on account of the smallness of individual orders. It has been a case of trying to curb mounting costs.

Hitherto the idea has been to cut costs by in-

creased production and by large single units. This dates back to Andrew Carnegie's time, if not earlier. The philosophy was that tonnage could be got, at a price. Now there is not enough business going to give anyone a fair operation and what is essentially an entirely new problem has been presented.

Not merely has the smallness of total volume created a new problem of cost curtailment, but the buying habits of customers have greatly added to it. Individual orders have become very small, quite insignificant by old standards, and the matter is not simply one of small volume, but of small volume made up of a large number of orders. Scheduling plants for fair sized runs, made up of numerous orders, is usually prohibited by the customer desiring almost instant shipment.

The chances are that relatively small general purpose mills and machinery will come into larger play in the period next ahead in place of large single purpose mills and equipment. The question will not be so much how large an output may the plant produce as how little will it make and still be efficient and economical.

In all the thought that is being given to this new problem there is the particular question, how long

this style will last. The longer it may last, the more attention can be given it at the present time. Eventually the sum total of business will have a large increase, but will it then be made up of large single orders as formerly, or will it still be in relatively small orders?

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Lessons in Speculation.

"SPECULATION is a parasite, feeding upon values, creating none."—Andrew Carnegie.

Speculation in commodities precipitated the 1921 depression. Speculation in land led to the collapse of the Florida boom. Speculation in securities brought on the stock market debacle.

Who can say that these harsh lessons were to no avail? Nineteen twenty-one ushered in a period of hand-to-mouth buying of commodities, and it is likely that the more recent Florida and Wall Street crises will have long-time effects on the real estate and securities markets. While the speculative instinct is strong, enlightened selfishness demands that it be restrained. In a highly interdependent world temporary individual gains are swallowed up by the inevitable tidal wave of losses which follows.

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If This Be Inflation

To the Editor: In your issue of Dec. 17, on the editorial page under the heading "If This Be Inflation," we find an article that in a very few words expresses one of the most potent causes underlying the present depression era. Your article is so well written and covers the subject so thoroughly that we feel it would be a material aid to the country as a whole if a copy were placed in the hands of every Senator and Representative in Washington; to say nothing of the desirability of having it read by the leaders of our banking institutions throughout the country.

We wish to compliment you on the position that you have taken and trust that you can take steps that will result in your position becoming known to those who should be most interested.

J. N. MOWERY,
General manager,
Worcester Pressed Steel Co.,
Worcester, Mass.

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The Ills of Democratic Governments

To the Editor: As a constant reader of your most valued publication, I note that, in your issue of Dec. 17, under the caption "Casuals," you write: "There is certainly something in the lesson that the thrifty, hard-working and hard-headed French have been the most immune from economic disaster."

Allow me to take exception to this statement, as you surely cannot have overlooked the fact that, only a few years ago, the French Government depreciated its currency to the extent of 80 per cent, which represents an appalling capital tax levy on the whole population, wholly

affecting the middle class which represents the stabilizing element of every modern country.

For the vast host of those who were despoiled of 80 per cent of their gilt-edged bond investments and bank deposits by loss of purchasing power of the franc, it certainly felt like *economic disaster*.

Other nations are today going through the same cleaning process, to wit, Canada, which you could hardly call a socialistic state in the past, so why blame the socialistic system for the ills which seem pretty common to all forms of democratic governments?

GEORGE HALET.

Montreal, Que.

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Purchasing Policies Undergoing a Change

To the Editor: I am still convinced our modern competitive system is ruining present business, and large company purchasing policies has been one of the major causes of present conditions. I do not, however, believe the competitive system must be abandoned, but out of these ruins will rise a smarter and wiser group which will not be so easily tricked.

Possibly industry will not so readily discard the older men of broad experience for young adventurers with foolish theories which work only under abnormal conditions. Possibly a man over 40 will again have a place under the sun. (I am 42 and just getting good, not useless.) After all, out of this all will come a lot of good, which unfortunately society does not seem able to learn in any other way. Included in the results will be sound, economic and honest purchasing, as well as sensible selling.

A. C. DENISON,
Cleveland.
President, Fulton Foundry & Machine Co.

SUMMARY OF THE WEEK'S BUSINESS

Year-End Recession in Activity Marked by Declines in Prices

Sheets, Cold-Finished Steel Bars, Track Spikes and Bolts Lower—
Ingot Output for Week Drops to 21 Per Cent

DOWNWARD readjustment of prices of some steel products, notably sheets, and continued weakness in others mark the year-end recession of activity in metal-working industries.

Several makers of sheets are soliciting business at concessions of \$2 a ton from prices that were put into effect on July 1, when a stabilization program was inaugurated that held fairly firm through the third quarter and most of the fourth. A recent break in automobile body sheets and some other finishes used by the motor car manufacturers has spread to all of the more commonly used grades. Makers of hot-rolled strip steel, having granted the usual concession of \$1 a ton to automobile companies, are trying to prevent this from becoming general.

MAKERS of bars, plates and shapes are quoting 1.60c. a lb., Pittsburgh, for first-quarter contracts. This price is holding in most instances on bars, but open quotations on plates and shapes are still frequently \$2 a ton less, with even sharper concessions on some of the larger tonnages of structural shapes. In this situation, some users of bars are bringing pressure for a reduction on that commodity, but mills have contracted with a part of their trade at 1.60c. Cold-finished steel bars have been formally reduced \$2 a ton to 2c., Pittsburgh, Cleveland and Buffalo.

Other price declines include \$1 a ton off on skelp, \$2 a ton on track spikes, \$6 a ton on track bolts, 15c. a ton on furnace coke and \$2 a ton on charcoal pig iron.

This week's changes bring THE IRON AGE finished steel composite price down to 2.075c. a lb., the low of the year, and the lowest since April, 1922, when quotations had risen above the extreme post-war dip to 1.998c. a lb. in February, 1922. The present level is \$1.54 a net ton above that point. The recovery in prices in 1922 was preceded by a rising trend in operations.

HOLIDAY shutdowns have reduced the rate of ingot production for the week to 21 per cent of the country's capacity, but finishing mills may operate at somewhat higher schedules, as the idleness is more general in steel-making than in rolling departments. Although the Pittsburgh district has sharply curtailed to 15 per cent for ingot output, the Chicago district, at 23 per cent, has made a slight gain over last week, and there is some improvement also in the Valleys,

while Cleveland mills will operate a part of the week at last week's 32 per cent rate.

It appears clear that general consumption of steel has shown no marked change, but curtailment is forced by the unwillingness of consumers and distributors to take in material until after Jan. 1. Most of the current orders are for January shipment. On the basis of these orders, together with expected replenishment buying and larger releases from the automobile industry, many of the steel companies believe they will be able to resume operations early in January at rates varying from 30 to 35 per cent.

STEEL buying in larger volume by the automobile industry is momentarily expected, little having been bought for first quarter. The change in plans by the Ford Motor Co. has not only held back the commitments of that motor car maker, but is believed to have had a halting effect on schedules of competitive companies. December output of cars is estimated at nearly 100,000, against about 65,500 in November. A further gain is expected in January, but just how much will depend upon when assemblies are started by the Ford plants.

Signs are lacking of improvement in takings of steel by the railroads and the building construction industry, but the farm implement industry has released fairly large orders for pig iron at St. Louis, indicating nearby increase in activity.

Building work in the week took only 14,000 tons of structural steel, of which 3300 tons will be used in the First National Bank Building, New York. New projects call for 22,500 tons, including 7300 tons for a hotel in Chicago and 5000 tons for a Federal building in San Francisco.

An order for 1200 tons of plates for the repair of 500 Chicago Great Western cars is outstanding in the railroad equipment field and indicative of the small amount of railroad buying. However, some roads are taking prices on their general requirements for first quarter.

INDEPENDENT sheet steel manufacturers operated in November at an average of 27 per cent, or three points below the ingot output for the country. Sales were also at the same rate, while shipments declined to less than 25 per cent of capacity. November was the poorest month of the year for the sheet mills.

▲▲▲ A Comparison of Prices ▲▲▲

Market Prices at Date, and One Week, One Month and One Year Previous,
Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron,

Per Gross Ton:	Dec. 22, 1931	Dec. 15, 1931	Nov. 24, 1931	Dec. 22, 1930
No. 2 fdy., Philadelphia.....	\$15.51	\$15.51	\$15.51	\$17.76
No. 2, Valley furnace.....	15.50	15.50	16.00	17.00
No. 2 Southern, Cin'ti.....	14.69	14.69	14.69	14.19
No. 2, Birmingham.....	12.00	12.00	12.00	14.00
No. 2 foundry, Chicago*.....	16.59	16.59	17.00	17.50
Basic, de'd eastern Pa.....	16.25	16.25	16.25	17.75
Basic, Valley furnace.....	15.00	15.00	15.00	17.00
Valley Bessemer, de'd P'gh..	17.76	17.76	18.26	19.26
Malleable, Chicago*.....	16.50	16.50	17.00	17.50
Malleable, Valley.....	16.00	16.00	16.50	17.50
L. S. charcoal, Chicago.....	23.04	23.04	25.04	27.04
Ferromanganese, seal'd car- lots.....	\$75.00	\$75.00	\$85.00	\$0.00

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

*Ferromanganese quotations adjusted to carload unit; larger quantities at discount.

Rails, Billets, etc.,

Per Gross Ton:	Dec. 22, 1931	Dec. 15, 1931	Nov. 24, 1931	Dec. 22, 1930
Rails, heavy, at mill.....	\$43.00	\$43.00	\$43.00	\$43.00
Light rails at mill.....	34.00	34.00	34.00	36.00
Re-rolling billets, Pittsburgh..	29.00	29.00	29.00	30.00
Sheet bars, Pittsburgh.....	29.00	29.00	29.00	30.00
Slabs, Pittsburgh.....	29.00	29.00	29.00	30.00
Forging billets, Pittsburgh..	35.00	35.00	35.00	36.00
Wire rods, Pittsburgh.....	35.00	35.00	35.00	35.00
	Cents	Cents	Cents	Cents
Skelp, gy'd, steel, P'gh, B...	1.50	1.55	1.60	1.60

Finished Steel,

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Bars, Pittsburgh.....	1.60	1.60	1.60	1.60
Bars, Chicago.....	1.60	1.60	1.70	1.70
Bars, Cleveland.....	1.65	1.65	1.65	1.65
Bars, New York.....	1.93	1.93	1.93	1.93
Tank plates, Pittsburgh.....	1.56	1.55	1.60	1.60
Tank plates, Chicago.....	1.60	1.60	1.70	1.70
Tank plates, New York.....	1.78	1.83	1.88	1.88
Structural shapes, Pittsburgh..	1.50	1.50	1.60	1.60
Structural shapes, Chicago.....	1.60	1.60	1.70	1.70
Structural shapes, New York..	1.75 1/4	1.80 1/4	1.85 1/4	1.85 1/4
Cold-finished bars, Pittsburgh..	2.00	2.10	2.16	2.00
Hot-rolled strips, Pittsburgh..	1.50	1.50	1.50	1.55
Cold-rolled strips, Pittsburgh..	2.00	2.00	2.05	2.25

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

Finished Steel,

Per Lb. to Large Buyers:	Dec. 22, 1931	Dec. 15, 1931	Nov. 24, 1931	Dec. 22, 1930
Hot-rolled annealed sheets, No. 24, Pittsburgh.....	2.30	2.40	2.40	2.35
Hot-rolled annealed sheets, No. 24, Chicago dist. mill..	2.40	2.50	2.50	2.45
Sheets, galv., No. 24, P'gh...	2.80	2.90	2.90	2.90
Sheets, galv., No. 24, Chicago dist. mill.....	2.90	3.00	3.00	3.00
Hot-rolled sheets, No. 10, P'gh	1.60	1.65	1.70	---
Hot-rolled sheets No. 10, Chicago dist. mill.....	1.70	1.75	1.80	---
Wire nails, Pittsburgh.....	1.90	1.90	1.90	1.90
Wire nails, Chicago dist. mill.	1.95	1.95	1.95	1.95
Plain wire, Pittsburgh.....	2.20	2.20	2.20	2.20
Plain wire, Chicago dist. mill	2.25	2.25	2.25	2.25
Barbed wire, galv., Pittsburgh	2.55	2.55	2.55	2.55
Barbed wire, galv., Chicago dist. mill.....	2.60	2.60	2.60	2.65
Tin plate, 100 lb. box, P'gh..	\$4.75	\$4.75	\$4.75	\$5.00

Old Material,

Per Gross Ton:	Dec. 22, 1931	Dec. 15, 1931	Nov. 24, 1931	Dec. 22, 1930
Heavy melting steel, P'gh....	\$10.25	\$10.25	\$10.25	\$12.75
Heavy melting steel, Phila....	7.75	7.75	8.00	11.00
Heavy melting steel, Ch'go....	7.75	7.75	8.00	10.00
Carwheels, Chicago.....	8.50	8.50	8.50	11.75
Carwheels, Philadelphia.....	11.50	11.50	11.50	14.00
No. 1 cast, Pittsburgh.....	10.00	10.00	10.00	12.50
No. 1 cast, Philadelphia.....	10.00	10.00	10.50	12.00
No. 1 cast, Ch'go (net ton)...	8.50	8.50	8.50	9.50
No. 1 RR. wrot., Phila.....	9.50	9.50	9.50	13.50
No. 1 RR. wrot., Ch'go (net)	6.50	6.50	6.50	8.50

Coke, Connellsville,

Per Net Ton at Oven:	Dec. 22, 1931	Dec. 15, 1931	Nov. 24, 1931	Dec. 22, 1930
Furnace coke, prompt.....	\$2.25	\$2.40	\$2.40	\$2.50
Foundry coke, prompt.....	3.50	3.50	3.50	3.50

Metals,

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York.....	7.37 1/2	6.87 1/2	6.87 1/2	10.12 1/2
Electrolytic copper, refinery..	7.00	6.25	6.25	10.00
Tin (Strait), New York.....	21.87 1/2	21.62 1/2	23.12 1/2	25.37 1/2
Zinc, East St. Louis.....	3.15	3.15	3.12 1/2	4.05
Zinc, New York.....	3.50	3.50	3.48 1/2	4.40
Lead, St. Louis.....	3.55	3.55	3.65	4.95
Lead, New York.....	3.75	3.75	3.85	5.10
Antimony (Asiatic), N. Y....	6.25	6.25	6.62 1/2	7.10

▲▲▲ The Iron Age Composite Prices ▲▲▲

Finished Steel

Dec. 22, 1931	2.075c. a Lb.
One week ago	2.095c.
One month ago	2.116c.
One year ago	2.121c.

Based on steel bars, beams, tank plates, wire, rails, black pipe and sheets. These products make 87 per cent of the United States output.

	High	Low
1931.....	2.142c., Jan. 13	2.075c., Dec. 22
1930.....	2.362c., Jan. 7	2.121c., Dec. 9
1929.....	2.412c., April 2	2.362c., Oct. 29
1928.....	2.391c., Dec. 11	2.314c., Jan. 3
1927.....	2.453c., Jan. 4	2.283c., Oct. 25
1926.....	2.453c., Jan. 5	2.403c., May 18
1925.....	2.560c., Jan. 6	2.396c., Aug. 18

Pig Iron

\$14.79 a Gross Ton
14.79
14.96
15.90

Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

	High	Low
1931.....	15.90, Jan. 6	14.79, Dec. 15
1930.....	18.21, Jan. 7	15.90, Dec. 16
1929.....	18.71, May 14	18.21, Dec. 17
1928.....	18.59, Nov. 27	17.04, July 24
1927.....	19.71, Jan. 4	17.54, Nov. 1
1926.....	21.54, Jan. 5	19.46, July 13
1925.....	22.50, Jan. 13	18.96, July 7

Steel Scrap

\$8.58 a Gross Ton
8.58
8.75
11.25

Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	High	Low
1931.....	11.33, Jan. 6	8.58, Dec. 8
1930.....	15.00, Feb. 18	11.25, Dec. 9
1929.....	17.58, Jan. 29	14.08, Dec. 3
1928.....	16.50, Dec. 31	13.08, July 2
1927.....	15.25, Jan. 11	13.08, Nov. 22
1926.....	17.25, Jan. 5	14.00, June 1
1925.....	20.83, Jan. 13	15.08, May 5

Pittsburgh Steel-Making Operations Sharply Reduced; Prices Weaken

PITTSBURGH, Dec. 22.—Steel-making operations in the district this week are sharply reduced, with not more than two open-hearth plants in operation. The year-end suspension was generally expected, but will not last longer than the present week in most plants. In the face of reduced steel production, finishing mill schedules are fairly well maintained because of the urgency for deliveries on the part of consumers. A few of the smaller strip and sheet mills are not running this week, but this is no departure from the usual procedure of alternate week operations. Other mills are generally active for a few turns. Schedules in the Wheeling district are approximately the same as last week, although activity will cease on Wednesday, Thursday and Friday. For that reason the average ingot producing rate will not be more than half of the 40 per cent figure which has prevailed in that district for several weeks.

Steel companies are generally looking to the first of the year for market trends. Specifications received thus far for January shipment indicate that there will be no difficulty in resuming production at the rate that prevailed before the year-end shutdown.

The price situation is the most disturbing factor in the market at present, and a gradual trend toward lower levels is in progress. A formal reduction in prices of cold-finished bars and shafting was announced in the last week. Quotations on bars, plates and shapes have been reaffirmed for first quarter, but the 1.60c., Pittsburgh, price is effective only on bars. Sheet quotations have weakened on practically all finishes, and special concessions on strip steel seem likely to establish a new market. Wire prices are generally holding, although there is no definite test of the new schedules.

Pig Iron

Shipments are at a standstill because of suspended operations in practically all of the foundries in the district. No interest in first quarter buying is reported, and prices are nominal, with Lake Erie furnace competition still a factor in the market.

Semi-Finished Steel

Occasional sales are bringing out price concessions. Makers continue to quote billets, slabs and sheet bars at \$29, Pittsburgh, and forging billets

Pittsburgh ingot operations drop to about 15 per cent this week; Wheeling district at 20 per cent and Valley at 25 per cent.

* * *

Finishing mill schedules are generally higher than the ingot rate.

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Price situation a disturbing factor in a dull market. Sheets lower. Cold-finished steel bars reduced.

* * *

Pig iron shipments almost at a standstill.

* * *

Scrap market steady despite lack of important buying.

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at \$35. Wire rods are quoted at \$37 on first quarter business, \$2 a ton above the current price.

Rails and Track Supplies

Some of the Eastern roads have issued inquiries for miscellaneous first quarter requirements of finished steel products, but no inquiry for rails or accessories has come out. Current releases are negligible. Railroad spikes are quoted at \$2.60 a 100 lb., a decline of \$2 a ton. No other price changes are reported.

Bars, Plates and Shapes

The general contract on the Pittsburgh Post Office, requiring about 15,000 tons of structural shapes, has been awarded but purchase of the steel probably will be delayed until late in January. No other sizable structural tonnage is pending in this district, and releases against old contracts are light. The same might be said of reinforcing steel, although the business has held up better than usual, and some orders for road work are coming in on which shipments will begin in the winter months. Buying of barges is dormant, but a little inquiry for Government work is appearing. River equipment for private companies is expected to be much more active in January and February. Demand for merchant bars is very quiet, but movement of alloy steel to the automobile industry has been somewhat heavier this month than last.

Makers of bars, plates and shapes

are attempting to continue the existing quotations as first quarter contracts are renewed. On bars, the price has been fairly well maintained at 1.60c., Pittsburgh, although the figure quoted cold-fining mills has been revised downward in line with a corresponding decline on cold-finished bars. Plate prices range from 1.50c. to 1.60c., while even the generally quoted price of 1.50c. on shapes is shaded from \$2 to \$4 a ton on attractive orders.

Cold Finished Steel Bars

The price of cold-finished steel bars has been revised downward \$2 a ton to 2c., Pittsburgh, following a rather strenuous effort on the part of mills to maintain their asking figure of 2.10c. Ground shafting has also been reduced, and is now quoted at 2.35c. to 3.30c., Pittsburgh or Cumberland, Md., depending on size. Demand shows no noticeable change.

Tubular Goods

Specifications have been light during the last week, reflecting the efforts of distributors to reduce their stocks prior to inventory taking. The principal consumers of standard pipe are dormant, and lapweld demand is almost entirely absent. No action on line pipe projects reported recently is expected before January. Mechanical tubing is quiet. Oil country demand is about the same as it was last month.

Wire Products

With only a few days left in which to release shipments on low-priced tonnage, consumers of merchant wire products have increased their specifications slightly. Additional tonnage of this sort is expected between now and the end of the month, although many buyers are too cautious about building up stocks to take advantage of low prices. Some contracting at the new levels is reported, but mills are inclined to await developments rather than to solicit orders too strenuously.

Sheets

Operating schedules last week showed a decline with nearly all makers, the average for the industry having been scarcely 25 per cent of capacity. Releases were also lighter, and production this week may drop even lower. However, most units will be operated for at least a few

turns, and the Friday holiday will not prove to be an interruption because activity has recently been confined largely to the first three days of the week. Releases from two or three motor car builders are holding up satisfactorily, but others are taking little or no sheet steel. The other major consuming groups are experiencing the usual year-end inactivity.

Sheet prices are weak on almost all finishes, and quotations under the asking market are more frequent. Galvanized sheets are still weak in the South, and shading is reported in the Eastern territory. On hot-rolled annealed material concessions from the recent price of 2.40c., Pittsburgh, have been secured principally by barrel makers and other large consumers, to whom quotations of 2.25c. have been made. The entire price structure is subject to the close scrutiny of both buyers and sellers.

Tin Plate

Production has fallen off slightly this week, and the majority of the mills are running only 10 turns. This will bring a drop in production of as much as 10 points, bringing the average for the industry to about 40 per cent of capacity. First quarter contracting has been largely completed.

Strip Steel

With specifications from the automobile industry a trifle lower this week, mill operations have dropped under 20 per cent of capacity. However, most plants are running a few turns, and the holiday will not seriously interfere with output. Prices on strip steel are generally weak, with concessions of \$1 a ton from 1.50c. and 1.60c., Pittsburgh, growing more common. Makers are unwilling to revise contracts to this level, but the tendency toward weakness is spreading. Cold-rolled strip is quoted at 2c. to 2.10c., with even lower figures reported in some instances. Not many first quarter contracts have been taken, and mills are not anxious to book forward tonnage at prevailing quotations.

Coke and Coal

Furnace coke is considerably weaker, with recent sales reported at as low as \$2.25, Connellsville. The foundry grade is unchanged, with demand this week at a standstill. Domestic coke is also quiet, and continues to show the adverse effects of unseasonably warm weather. Domestic coal demand is lacking for the same reason, but production is very low and no large surplus has appeared on the market.

Old Material

Although one or two very small sales have been reported in the last week, the scrap market is very dull. Prices paid for No. 1 heavy melting steel average about \$10.25, but purchases against old orders are not being made frequently at less than \$10,

and the market continues at \$10 to \$10.50. A little distress scrap is appearing on the market as hold-ups are in effect at all the principal ship-

ping points this week. Foundry operations are generally suspended for the holidays, and no buying of these grades of scrap is reported.

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Valley Steel Operations Slightly Higher Because of Orders from Automobile Makers

YOUNGSTOWN, Dec. 22.—Valley steel production schedules are being closely adjusted to current releases, but the rate of operation fluctuates from day to day and it is difficult to estimate current activity. Steel ingot production a week ago dropped down to about 20 per cent of capacity, but recent changes have been in the form of improvement and production at the beginning of this week amounts to almost 30 per cent. Assuming an almost complete suspension of activity on Wednesday evening for the remainder of the week, output during the seven-day period will be approximately 25 per cent of capacity.

Finishing mill schedules as a whole average at about the same rate, with changes reported from day to day. Sheet and strip mills have the best schedules, as releases are being received from the automobile industry from time to time, most of which call for immediate delivery. Pipe output is averaging about one day a week for the district's entire capacity, and, in the absence of large line pipe orders, is supported by miscellaneous small orders.

First quarter contracts taken by Valley steel producers have not bulked very large, but makers generally have not been pressing for orders because of the uncertain price situation. Many buyers are not interested in making forward commitments, even though price concessions are offered, and mills feel that any efforts to stimulate business artificially will be of no particular advantage to either buyers or sellers. Large steel consumers in the immediate Youngstown territory are suspending operations for year-end inventory taking, and the absence of their releases naturally affects local mill operations considerably. This is particularly true in the case of steel plates for tank and other work and of small shapes, bars and sheet steel going to makers of building materials.

Prices for first quarter are gradually being clarified, but weakness persists in many products upon which Valley mills depend for a large part of their tonnage. In contrast to the general market, prices on wire and nails are being well held, and consumers seem to be reacting favorably to the recent revision in selling schedules of merchant wire products. While little forward contracting has been reported as yet, no determined opposition to the new quotations has been encountered. Pipe prices are also better maintained than usual, al-

though there is little large tonnage in the market to offer an adequate test. Makers of bars are accepting first quarter contracts at 1.60c., Pittsburgh, and the same quotation is made on plates. On the latter product concessions are more frequent.

Cold-finished bar prices have been reduced \$2 a ton on first quarter contracts, now standing at 2c., Pittsburgh or Cleveland. While concessions of \$1 a ton have appeared on hot-rolled strip in the Detroit territory, the general market remains at 1.50c. and 1.60c., Pittsburgh, depending on width. Cold strip is weak, with 2.05c., Pittsburgh or Cleveland, reported to be the minimum on small-lot tonnage. Hot-rolled annealed sheets are fairly well held, except on certain special contracts which ordinarily take a differential. Galvanized sheets are probably the strongest in the sheet list, with general adherence to 2.90c., Pittsburgh.

No activity is reported in the raw materials market, although consumers are closing on their 1932 requirements of ferroalloys. Pig iron is very dull, and the competition of Lake Erie furnaces has forced current prices to new low levels. Foundry iron is now quoted at \$15.50, and malleable and Bessemer iron at \$16, Valley furnace. Scrap is quiet, with quotations holding at recent levels.

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Westinghouse Electric & Mfg. Co., East Pittsburgh, and Westinghouse International Co. announce that they have concluded an agreement with Eroole Marelli & Co., Milan, Italy, a leading Italian electric manufacturing concern, calling for an exchange of patents and experience. The Westinghouse companies do not participate financially nor take any part in the management of the Italian company.

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Production of bituminous coal in November, according to preliminary figures of the United States Bureau of Mines, was 30,020,000 net tons, while anthracite coal production was tentatively placed at 4,140,000 net tons and beehive coke at 98,000 net tons. These figures reflect a marked decrease, compared with the total reported in November, 1930, when the bituminous output aggregated 38,122,000 net tons; anthracite, 5,116,000 net tons, and beehive coke, 166,300 net tons.

Chicago Ingot Output Gains Slightly; Steel Specifications Increase

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CHICAGO, Dec. 22.—Contrary to expectations at this time of year, ingot production in the Chicago area is making a slight gain and is well entrenched at about 23 per cent of capacity. There is no influence of rail tonnage in this figure, the gain being well distributed as to mill products and classifications of consumers. Momentarily specifications are turning up. There is also a better tone to purchases, which for the most part are at close range.

Prices on many commodities still lack clarity. Some reductions have occurred. Sheet quotations are being shaded. Charcoal iron has settled to \$20 a ton, furnace, and to \$17 a ton, Chicago dock. Track spikes and bolts are also down in a listless market.

There is still much talk of efforts to raise prices on plates, shapes and bars, but so far as can be learned here no producer has taken the leadership.

Of special interest to Chicago producers is the progress being made in condemnation proceedings leading up to the construction of a subway, which will require large tonnages of structural steel and reinforcing bars.

An interesting turn is about to take place in the local scrap market. For years certain steel producers have been all but self sustained as to scrap. However, in the last two years new steel-making capacity has been added, which, when called into service, will force these units into the open market for the additional scrap needed. This will absorb a part of Chicago's enormous scrap supplies and make for better marketing conditions.

Manufacturing industries are slowing down for the year-end, but steel producers' policies are as yet undetermined.

Pig Iron

Of special interest in this market are sales of charcoal iron at \$17 a ton, Chicago docks. Prices at furnaces are \$20. It is estimated that fully 15,000 tons was brought by boat to Chicago and Milwaukee docks and probably 1500 tons has been moved to consumers at prices that approximate those on Northern foundry iron. The Southern iron market is dull, with prices well established at \$11 a ton, Birmingham. Shipments of Northern iron are better than those of September and October, but are not quite equal to the rate in November. Re-

Despite a general reduction in production of ingots throughout the country, the Chicago rate turns up slightly to 23 per cent.

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Steel Specifications have gained, at least momentarily, orders coming from widely diversified consuming lines.

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Lower prices on charcoal, pig iron, sheets, track spikes and track bolts.

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leases for delivery after Jan. 1 are few, and sellers now have little to gauge what will take place early in 1932. New sales are few in number. Silvery is quiet, with ample supplies available on Chicago docks.

Ferroc alloys

Contracting for ferromanganese is practically at an end. Users are showing little interest in spiegeleisen for the reason that previous low prices induced them to take in supplies, and the carryover tonnages are said to be large.

Coke

Prices for by-product foundry coke are firm at \$7.50 a ton, local ovens. Fully 85 per cent of the contract buyers have signed at this figure. Shipments are down slightly.

Warehouse Business

Warehouses are experiencing a fairly steady volume of business at a time when there is usually a definite slackening in consumers' needs. Individual orders are small, but in the aggregate are satisfactory if the average in October and November is taken as a basis.

Wire Products

A small amount of first quarter business is being placed and some spot business is still before the trade. December specifications are above the average of the preceding month; however, shipments may not match with those of November as many of the releases now coming in are for delivery in January. Demand from the jobbing trade is light, but jobbers' stocks are small. Wire producers are hopeful that the spring movement in

rural districts will show improvement. Shipments to automobile manufacturers are not up to expectations. Production ranges from 20 to 25 per cent of capacity.

Cast Iron Pipe

A few private inquiries have developed, but there seems to be nothing urgent in the matter of closing contracts. Public work is quiet; a few anticipated projects are being held back because of a dull bond market. Several pipe foundries have closed for the remainder of the year.

Structural Material

Low bidders have been announced on about 6000 tons of public work. Fabricators are still looking into the future with considerable uncertainty. They see little private work ahead of them and they wonder how long public work can continue to come to their aid. Condemnation proceedings leading to the construction of a subway are moving rapidly. Fabricators' operations remain low. Two apartment hotels of the speculative type are being planned for Chicago.

Reinforcing Bars

Price advances announced recently have now become general, and it evidently is the intention of most dealers to cancel on Jan. 1 all outstanding quotations that are below the new card levels. Dealers are now asking 1.75c. to 2c. a lb. for billet bars, depending on the tonnage, and 1.55c. to 1.80c. for the rail steel product. Illinois State buildings at Manteno call for 800 tons. Bids have been opened on 5000 tons for locks and a dam at Rock Island, Ill. Announcement of the award of the general contract is expected at an early date.

Rails and Track Supplies

Track spikes are off \$2 a ton to 2.60c. a lb., mill, and track bolts are down \$6 a ton to 3.50c. a lb. The Western market is unusually dull both as to track supplies and rails. Mill schedules range from 15 to 20 per cent of capacity.

Sheets

Price levels continue to give ground. No. 24 hot-rolled annealed sheets are quoted at 2.40c. a lb., Chicago mills, and the galvanized product has dropped to

2,90c. Contractors for the Chicago Post Office are in need of 1200 tons of sheets, orders for which are expected soon. Jobbers are entering the market in a small way for tonnages to be delivered after Jan. 1. Manufacturing trade is dull and gives little indication of its requirements in the new year.

Bolts, Nuts and Rivets

This market is dull both as to new buying and specifications. Price weakness persists, especially where business of size is in sight. Producers will enter the new year with very few contracts on books.

Plates

About 1200 tons of car repair materials have been placed with local mills by shops that will repair 500 cars for the Chicago Great Western. Otherwise, the railroad equipment market is dull. This is a very quiet period in the plate market. Fabricators throughout all of the Western territory are badly in need of work.

Bars

Probably the most significant de-

velopment in the local bar market is the resumption of operations by the mills at Moline, Ill., which are important factors in supplying steel to the farm equipment industry. These units have not been in production for several months. Demand for bars has turned rather spotty in all directions, including automobile manufacturing centers.

Old Material

This market is at a standstill. Most prices are nominal. Movement of heavy melting steel is near the low point of the year; however, a change upward after the turn of the year is indicated by growing interest in January needs. Chicago producers, having added to capacities, are finding that they are less self-sustained as to scrap. Hold-up orders are more numerous, as many users plan shutdowns the day before Christmas with the expectation of being idle until after Jan. 1. On recent railroad offerings only a few items on each list have been sold. This is a reflection of a dull market as well as difference of opinion as to prices between railroads and dealers.

mains firm at \$11, base Birmingham, in a dull market, while Northern continues to be uncertain outside Cincinnati, while in the city proper the quoted price of \$17.90, delivered, is unchanged.

Finished Steel

Current requirements of sheet users have sustained demand at slightly under 40 per cent of capacity output. Inquiry for first quarter has increased.

Old Material

Further restrictions on shipments to district mills have increased the dullness of the scrap market. Lack of sizable inventories gives color to predictions of a revival in demand following the inventory period. Dealers bids, while nominal, were readjusted downward the past week.

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Buffalo Expects Gain in Pig Iron in January

BUFFALO, Dec. 22.—While this is a lean month in pig iron sales, producers have evidence that considerably more business will be placed in January than during December. Salesmen's reports show that some good-sized tonnages will be placed by the Eastern trade during the first two weeks of 1932. Already some backlogs of small orders have been assembled for early January shipment. Stocks of pig iron in producers' yards in this district are less than half of those of a year ago.

Finished Steel

Operations of Buffalo steel mills are slightly less this week than last week. The Lackawanna plant of Bethlehem Steel is now operating seven open-hearths. Republic Steel will confine its this week's operations to a few turns on the bar mill with no steel-making activity. Wickwire Spencer is operating two open-hearths.

Old Material

The market for No. 1 heavy melting steel has again been broken by a new sale to the largest consumer in the district at \$8. The last previous sale was made at \$8.50. Other transactions are at a minimum, with the second and third largest consumers in the district having suspended shipments until Jan. 1.

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K. C. BROWNELL has been appointed manager of metal sales for the American Smelting & Refining Co., New York. Hamilton Brush continues as vice-president in charge of sales. Mr. Brownell has been in the sales department for the past two years, prior to which he was connected with the purchasing division.

Birmingham Iron and Steel Business Very Dull; Operations Low; Some Shutdowns Over Holidays

BIRMINGHAM, Dec. 22.—Buying of pig iron has been extremely light lately and still consists mostly of earload lots. There is virtually no interest in the market, either for the present month or for the first quarter. The price of \$12, base, for district deliveries is being maintained. Woodward Iron Co. discontinued its operations on Dec. 15 for an indefinite period. Two blast furnaces were banked. The Tennessee Coal, Iron & Railroad Co. resumed operations at Ensley No. 3 on Dec. 16, in preparation for the reopening of the Ensley rail mill, which will take place some time in January. This company now is operating three furnaces, two on basic and one on foundry. There are two other active stacks in the district, making a total of five in operation.

Finished Steel

Steel demand is dragging. Some first quarter contracts are being closed. Fabricators of structural steel, reinforcing bars and plate booked no order of any size. The date for reopening of the Ensley rail mill of the Tennessee company has not been announced, but a statement is expected this week. Last week the Tennessee company operated four open-hearths, a decrease of one from the preceding week. Gulf States Steel continues to operate alternate weeks. Three open-hearths were in service

last week, but this week they will be idle.

Cast Iron Pipe

Holiday shutdowns commence this week and will last from two to three weeks in most cases. Plant operations recently have been about 30 per cent. Quotations continue at \$32 to \$33, Birmingham.

Old Material

Only a small amount of old material is moving, as requirements grow more restricted. A number of downward revisions have been made in prices.

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Cincinnati Sees Signs of Forward Pig Iron Buying

CINCINNATI, Dec. 22.—Interest in first quarter pig iron business was revived the past week when four district melters sought quotations on their future requirements. Two Indiana consumers issued inquiries for 1000 tons and 500 tons of Northern iron respectively and two Ohio melters sought prices on the same quantities. Sales the past week stayed near the 1000-ton level, consumers taking only small quantities to sustain current operations. Southern iron re-

Cleveland Mills Await Buying by Automobile Manufacturers

Business in Year-End Lull Extremely Light—Price Weakness in Sheets, Strips, Reinforcing Bars

CLEVELAND, Dec. 22. — The usual year-end lull is in evidence and is resulting in a decline in orders for finished steel. Buyers in some cases are placing small lots with the stipulation that the steel is not to be shipped until after Jan. 1. However, most of the purchases are for immediate requirements. Local steel plants started the week with an operation of 32 per cent of ingot capacity, or the same as last week, but there will be a pretty general holiday shutdown of open-hearth furnaces and also finishing mills during the last half of the week and into next week.

Steel makers are looking for a new spurt of buying shortly from the automotive industry, as little steel has been purchased by the motor car manufacturers for the first quarter. Round tonnages are to be placed by the Chevrolet, Ford and some of the other companies. The delay of the Ford company in bringing out new models is proving to be somewhat of a check on the industry. Output of motor cars in January and February is expected to show considerable gain over that of December.

The price situation remains unsettled, with weakness most pronounced on sheets. Steel furniture sheets have been marked down \$2 a ton, the \$2 a ton lower prices named recently on cold-rolled sheets have become common quotations, and hot-rolled annealed sheets are down fully \$2 a ton. Cold-finished steel bars have been established for the first quarter at a \$2 a ton reduction from recent prices.

A leading producer has opened its books for the first quarter at the present regular prices of 1.60c., Pittsburgh, for shapes and plates, and 1.65c., Cleveland, for bars. Other mills have closed a few contracts at these prices without making a definite announcement of prices for the quarter. However, consumers are taking very little interest in contracts. They see no advantage in making commitments for the quarter, as they feel that open market conditions are likely to prevail during the quarter.

Pig Iron

Sales and inquiry have dropped off with the approach of the holidays. While shipments are holding up to recent volume, they are expected to decline during the remainder of the month. The recent \$1 a ton decline to \$16 for foundry and malleable iron for local delivery has not stimulated interest. A northern Ohio consumer has purchased 3000 tons of foundry and malleable iron from a Lake fur-

nace for the first quarter. A round-lot inquiry from a local melter for that delivery is still pending. Cleveland prices are unchanged at \$15 to \$15.50 for outside shipment. For western Ohio, Indiana and Michigan delivery, other Lake furnaces quote \$16 to \$17. Lake Superior charcoal iron has been reduced \$2 a ton to \$20, furnace.

Iron Ore

Consumption of Lake ore amounted to 1,311,212 tons during November, a decrease of 139,962 tons from October. This compares with 2,639,836 tons used in November, last year. Furnace stocks Dec. 1 were 33,183,823 tons and the amount at furnaces and Lake Erie docks was 39,232,150 tons, or almost 2,000,000 tons less than on the same date a year ago, when stocks were 41,226,806 tons. Central district furnaces used 691,235 tons in November, a decrease of 62,937 tons. Lake front furnaces consumed 602,146 tons, a decrease of 74,483 tons. All-rail furnaces used 7749 tons, a loss of 2579 tons, and Eastern furnaces used 10,082 tons, a gain of 37 tons. There were 63 furnaces using Lake ore in blast Nov. 30, or the same as on Oct. 31.

Bolts, Nuts and Rivets

Rivet makers have opened their books for the first quarter at present prices of \$2.25 a 100 lb., Cleveland and Pittsburgh, and 70, 10 and 5 per cent discount for small rivets. Bolt and nut makers report a slight gain in orders over November. The market is still somewhat irregular, although the 73, 10 and 10 per cent discount is prevailing for most business.

Cold Finished Steel Bars

A formal price reduction of \$2 a ton to 2c., Cleveland and Pittsburgh, for current business and the first quarter has been announced. The market has been irregular recently, with concessions to the 2c., Pittsburgh, price. Orders are very light.

Warehouse Business

A \$5 a ton reduction to \$4.75 on galvanized sheets was made by the leading jobber this week. Other prices are unchanged.

Strip Steel

Orders are light and confined to small lots. The new prices of 1.50c. for wide and 1.60c. for narrow hot-rolled strip are being named by some producers, who have been holding out for a \$1 a ton higher price, and a few first quarter contracts that have been

taken at the higher quotations probably will be revised.

Sheets

Both heavy and light cold-rolled sheets have been marked down \$2 a ton, the former to 2.25c. and the latter to 2.85c. and the market is weak on hot-rolled material, although prices on these grades are not clearly defined because of the limited amount of business. However, on hot-rolled annealed sheets the 2.25c. price recently named to barrel manufacturers has become rather common. In line with price declines on other grades, metal furniture sheets have been reduced \$2 a ton, No. 10 now being quoted at 2.65c. Demand for all grades continues slow.

Bars, Plates and Shapes

Activity in these products is very light. Little new inquiry is coming out in the building field. Interest of fabricators is centered in the Pittsburgh Post Office, for which the general contract has been awarded to Aronberg-Fried Co., Cleveland. The steel, 15,000 tons, will be purchased through the contractors' New York office, but probably will not be awarded until after Jan. 1. Merchant steel bars are firm at 1.65c., Cleveland. A round tonnage of billet steel reinforcing bars for a Cleveland job recently went at 1.40c., Cleveland, which seems to be established as the market on a sizable lot. The only demand for plates and shapes is for small lots, which are bringing 1.60c., Pittsburgh, but this would be shaded on round lots.

Old Material

Shipments are being quite generally held up, although small tonnages are being taken by Youngstown and Sharon mills. No new demand is expected during the remainder of the year. No further price reductions are reported.

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New England Pig Iron Buying in Car Lots

BOSTON, Dec. 22.—The nearness of the inventory-taking period checked pig iron buying the past week, sales being confined to scattered car lots.

Old Material

Local brokers have orders for steel turnings, steel mill borings and blast furnace borings and turnings for which they can pay \$1.05 a ton, on cars shipping point, but they have been unable to buy materials at this price. One broker has an order for No. 1 heavy melting steel, for which he can pay \$3.10 a ton, on cars, but is unable to cover at that price. Scrap prices otherwise are nominal. Heavy melting steel at \$9 to \$9.50 a ton, delivered Youngstown, figures back to \$3.30 to \$3.80 a ton on cars here, but nobody will sell at such low figures.

Eastern Pennsylvania Output Further Curtailed by Holidays

Buying Reaches Low Point and Ingot Production Declines—
400 Tons of Sheets to Be Used for Trucks

PHILADELPHIA, Dec. 22.—Producers and consumers of steel are greatly curtailing operations, or closing entirely over the holiday period, so that ingot output in this district does not average above 12 per cent. Two mills will have no open-hearth furnaces operating until after Jan. 1, and most of the others will operate only one furnace each. Rolling departments may be closed for the greater part of the holiday period, but this will depend largely on the orders in hand at the end of this week.

Current buying is too small to provide a test of prices. Shapes, however, are lacking in strength when desirable business is offered. Current sales, for delivery after Jan. 4, are being made with the understanding that the buyer shall pay any advance in freight rates.

Of the projects requiring substantial steel tonnages, 8000 tons of plates and shapes for two railroad car transports to be built by the Sun Shipbuilding & Dry Dock Co., Chester, Pa., will probably be allocated next week, and eastern Pennsylvania plate mills expect to participate in the material for one ship. Award is awaiting the result of tank pressure tests in Washington. About 400 tons of Nos. 7 and 12 gage blue annealed sheets may be placed soon by an automobile body builder in Trenton, N. J., for bodies on 500 White motor trucks ordered by New York City. Local construction is small, but new building work in Washington may take 30,000 tons of steel.

Pig Iron

Most consumers of foundry pig iron are delaying purchases until after the turn of the year. Some foundries will be shut down during the holiday period. Lack of buying prevents any real test of prices. Only a small part of first quarter requirements is estimated to have been covered, even though foundry operations are not appreciably higher. No basic iron has been bought; users are not inclined to anticipate requirements.

Plates, Shapes and Bars

Plate prices are maintained on current small business at 1.65c., Coatesville, Pa., or 1.73 $\frac{1}{2}$ c., Philadelphia. Plate mills are preparing to bid on part of a 400-ton inquiry to be made by a Trenton, N. J., automobile body builder, as some of the material is to be 3-16 in. thick. Shape prices are irregular, but most of the current buying is at 1.60c., or 1.65c., f.o.b. nearest mill to consumer, or 1.64 $\frac{1}{2}$ c. to

1.60 $\frac{1}{2}$ c., Philadelphia. Merchant bar prices are unchanged at 1.60c., Pittsburgh, or 1.89c., Philadelphia. Billet steel reinforcing bars are subject to concessions of \$2 and more a ton from 1.60c., Pittsburgh, or 1.89c., Philadelphia.

Sheets

A local automobile body builder is completing the first of the bodies for the new Ford model. Eastern Pennsylvania manufacturers of blue an-

nealed sheets are preparing to bid on 400 tons for a Trenton, N. J., automobile body builder, but part of the order may specify widths up to 82 in. in the lighter gages, and only a few mills are equipped to roll this wide specification.

Imports

In the week ended Dec. 19, arrivals at this port included 5000 tons of manganese ore from Brazil and 2540 tons of chrome ore, of which 2000 tons was from Portuguese Africa and 540 tons from South Africa. Steel imports consisted of 25 tons of steel bars and 15 tons of structural shapes from Belgium and 45 tons of steel bars and 10 tons of structural shapes from Germany.

Old Material

The market is inactive. Prices of all grades are generally unchanged in the absence of business.

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St. Louis Farm Implement Manufacturers Issue Heavy Pig Iron Releases and Will Buy More Soon

ST. LOUIS, Dec. 22.—The week has been marked by the issuance of heavy shipping schedules for pig iron by manufacturers of agricultural implements in the St. Louis territory, and these interests are said to have indicated to makers that they will be in the market by Jan. 15 for additional tonnages. Stove plants either closed yesterday or will close today for the holiday and inventory periods, some prolonging operations longer than their sales warranted in order to give their employees as much work as possible before Christmas. The tone of the market is firm and unchanged.

Finished Steel

Recent awards to fabricators of highway bridges in Illinois and Oklahoma have been reflected in the placing of a considerable tonnage of structural shapes and plates with mills during the last week. Otherwise, business was quiet. A canvass of the railroads centering here has revealed that no program for 1932 steel expenditures has been decided upon.

The Callahan Construction Co., St. Louis, general contractor for the Madden Dam at Panama, Canal Zone, has awarded 2500 tons of steel sheet piling to the Bethlehem Steel Export Corp.

Old Material

Conditions in the scrap market were aggravated during the week by the action of two of the largest consumers in stopping shipments against contracts until after Jan. 1. One factor is the largest user in the district of busheling and borings and the other of heavy melting steel. No additional business from any source was placed, and no buying is expected un-

til after the turn of the year. Railroad springs and railroad malleable are off 25c. and 50c. a ton, respectively. Railroad lists: Chicago, Burlington & Quincy, 9501 tons; International-Great Northern, 1450 tons; Missouri Pacific, 150 carloads; Chicago, Milwaukee, St. Paul & Pacific, 120 carloads; New York, Chicago & St. Louis, 42 carloads; St. Louis Southwestern, 12 carloads.

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Canadian Business at a Low Point

TORONTO, Dec. 22.—Little in the way of new business has developed recently in the Canadian iron and steel markets, and not much activity is expected until after the holiday season. Buyers in general are holding inventories to a minimum. In pig iron business is featureless. Occasional orders are appearing for single car lots, but no large tonnages have been booked either for spot or future delivery. Prices are unchanged.

Old Material

Stagnation prevails in iron and steel scrap. There is very little inquiry, and consumers are holding purchases to a minimum. Dealers are still out of the market.

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Pacific Coast Steel Co., subsidiary of the Bethlehem Steel Corp., will erect an office building in Los Angeles to cost \$55,000.

Price Situation Uppermost in New York Steel Market

Sheets Offered at Concessions of \$2 a Ton—Plates and Shapes Weak—Bar Buyers Seek Reduction

NEW YORK, Dec. 22.—The price situation is uppermost in the New York district steel market, fresh weakness having cropped out in several products. Several makers of sheets are openly soliciting business at prices \$2 a ton below those recently quoted. Hot-rolled annealed sheets, No. 24 gage, are offered at 2.30c., Pittsburgh, galvanized sheets at 2.80c., with some quotations of 2.75c., and other sheet finishes are correspondingly lower. There is no disposition to take contracts for first quarter at these prices, but business is being accepted for January shipment.

In plates and structural shapes, a spread from 1.60c. to 1.70c., f.o.b. Eastern mill, is in effect, the lower price applying on the larger orders and the top price on small pick-up lots. Users and distributors of bars, noting the recent weakness in prices of plates and shapes, are bringing pressure to bear on mills to give them lower bar prices, but apparently without success. The bar price remains fairly firm at 1.60c., Pittsburgh. Cold-finished steel bars have been formally reduced \$2 a ton.

Business is exceedingly dull. Some orders are being received, but they specify January shipment in most instances. The largest fabricated structural steel order was 3300 tons for the First National Bank Building, Wall Street and Broadway.

Pig Iron

Although this market generally reflects the lull attending the year-end holidays, in several instances activity is being unusually well maintained for this time of the year. A number of foundries are still specifying small lots for shipment during the remainder of the month, indicating that yard stocks are near depletion. Sales for the week did not exceed 3000 tons, compared with 3500 tons the preceding week and 3000 tons two weeks ago.

A New England melter is negotiating for 1000 tons of malleable iron for delivery in the Philadelphia district. Otherwise, demand is restricted to car lots.

Prices are unchanged, with \$15 a ton, furnace, being quoted generally on small quantities by Buffalo and eastern Pennsylvania producers. Southern iron, which is still held at \$11, Birmingham, for shipment to the North, is virtually non-competitive in this district. Lake Superior charcoal

furnaces have reduced their schedule to \$20 on charcoal iron for Eastern delivery, representing a decrease of \$1 to \$2 a ton from former prices.

The Chateaugay Ore & Iron Co., Standish, N. Y., low phosphorus iron producer, plans to light its stack about Jan. 4.

Cast Iron Pipe

City of Buffalo opened bids Tuesday on about 8000 tons of 36 to 60-in. pipe and 350 tons of 8 to 60-in. fittings. Alternate bids have also been taken on steel pipe. Newcastle, N. Y., is inquiring for 200 tons of 6 and 8-in. pipe. Awards for the week included 635 tons of 8 and 12-in. for Waterville, Me., 450 tons of 8-in. for Arlington Water District, Poughkeepsie, N. Y., and 300 tons of 30-in. for Westchester County sewer project in South

Yonkers, N. Y., to United States Pipe & Foundry Co.; 400 tons of 24 and 36-in. for section "E", Sawmill River sewer project, Mount Pleasant, N. Y., to Warren Foundry & Pipe Corp.; 250 tons of 12-in. for Water Bureau, Hartford County, Conn., and 175 tons of 6 and 8-in. for Augusta, Me., to R. D. Wood & Co.

Reinforcing Bars

Prices are nominally unchanged at 1.60c., Pittsburgh, or 1.93c., delivered New York. Award is expected to be made soon on 585 tons of bars for the First National Bank Building, 2 Wall Street, on which project Marc Eidlitz & Son, Inc., is general contractor. Contract for 520 tons of bars for Piers 88, 90 and 92, Hudson River, was awarded by Allen N. Spooner & Son, Inc., general contractor, to Empire Steel Products Co., Inc., New York.

Old Material

Transactions in all grades of scrap are at a low level for the year. A small tonnage of Nos. 1 and 2 heavy melting steel is being loaded on barges in New York harbor at \$5.50 a ton, on barge, for spring shipment to Buffalo. Occasional carloads of No. 1 steel are moving from this district to the consumer at Coatesville, Pa. Buying prices are generally unchanged.

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Pacific Coast Municipalities Approve Projects Calling for Large Tonnages of Pipe

SAN FRANCISCO, Dec. 21.—Bond issues authorized by voters at San Diego, Cal., and Salem, Ore., carry provision for 34 miles of 36-in. pipe to be specified early next year. The Salem project includes \$586,000 for 26 miles of 30 to 36-in. pipe in place, and more than \$1,250,000 additional for a distributing system. The San Diego project provides \$442,000 for eight miles of 36-in. main.

An election at Sacramento, Cal., defeated by only 700 votes a \$10,800,000 bond issue for a mountain water supply project, which contemplated 60 miles of 40 to 63-in. main.

Contracts let for major projects the past week require more than 2900 tons of steel, with upward of 10,000 tons called for in new projects. Lettings were greatest in bars, with 2250 tons. More than 8500 tons of shapes and 1225 tons of plates will be required for new projects.

Cast Iron Pipe

Bids were opened on more than 1300 tons, with no important new calls for public bids. United States Cast Iron Pipe Co. is low on 1100 tons of 10-in. for Long Beach, and the same company, with the Pacific States Cast Iron Pipe Co., is low on 220 tons at

Burbank. A move is reported, especially in southern California, to induce municipalities to establish specifications which will preclude the use of foreign pipe.

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Railroad Equipment

SHIPMENTS of railroad locomotives in November totaled only seven units, a decline of two under October, according to reports made to the Bureau of the Census by the principal producing plants. The November shipments, all for domestic account, consisted of six steam locomotives and one electric locomotive. Shipments in the 11 months of 1931 totaled 147, compared with 714 in the first 11 months of 1930. Unfilled orders at the end of November totaled 130 locomotives, made up of 105 electric and 25 steam, four of the latter being for export. Unfilled orders at the end of October totaled 112 locomotives.

Monsanto Chemical Works, St. Louis, has ordered 11 tank cars from American Car & Foundry Co.

Chicago Great Western has ordered 1200 tons of car material through Western car builders' shops for repairs to 500 cars.

Sheet Steel Sales and Output Low in November

November was the low month of the year in the sheet steel industry in sales, production and shipments, according to the report of the National Association of Flat Rolled Steel Manufacturers covering activities of independent producers. Sales and production were less than 27 per cent of capacity, and shipments were under 25 per cent of capacity. Sales and production were virtually the same. Sales amounting to 102,867 tons declined over 14,000 tons as compared with October. Production, amounting to 102,758 tons, declined 2000 tons. Shipments fell off more than 34,000 tons. The November report and comparison in net tons follow:

	Nov.	Oct.	Sept.
Sales	102,867	117,195	120,688
Production	102,758	122,739	116,842
Shipments	94,975	129,365	123,371
Unfilled orders	147,169	159,367	167,366
Unshipped orders	58,533	66,778	75,816
Unsold stocks	74,763	70,465	67,337
Capacity per month	559,000	548,000	540,000
Percentage reporting	68.9	67.6	67.6
Percentages, Based on Capacity			
Sales	26.7	31.6	33.0
Production	26.7	33.1	32.0
Shipments	24.6	34.9	33.8
Unfilled orders	38.2	43.0	45.8
Unshipped orders	15.2	18.0	20.8
Unsold stocks	19.4	19.0	18.4

Chicago Building Trades Urge Lower Union Wages

A movement among employers to reduce wage scales in the Chicago building field has been started by the Iron League of Chicago. A resolution calls upon Chicago labor organizations "to follow the example of labor organizations in other parts of the country in considering a revision of wage scales to levels that will permit construction of buildings and homes at costs which present day investors can afford to pay."

A joint meeting of all building trades employers' groups and union labor is to be called in the near future.

Ford Program Continues Center of Interest

(Concluded from page 1639)

outdoor work, so that the total number idle in Detroit still hovers around 150,000 and probably will continue there throughout the winter.

The new Rockne will not be in production at the local Studebaker plant until the latter part of January. Meanwhile, it has been announced that the model 75 will sell at \$685 to \$735. The DeSoto six, a Chrysler product, will be priced under \$700 and will be much snappier in appearance than the present line. Cadillac is to present many new refinements when its mod-

els are announced Jan. 2 and now is employing a normal force of 6000 men. Oakland-Pontiac is getting under way at a fair pace, and the foundry is reported running six days a week. Buick continues to set a pace exceeded in the industry only by Chevrolet. Graham-Paige with its new Graham eight promises to be the sensation of the year, the radical departures in body and mechanical design, combined with a low price, already having attracted far more than normal attention. There has been no change in the Chevrolet schedule, which still calls for 37,000 cars this month and about 50,000 in January. Hudson, Chrysler, Hupp and Dodge are slow in getting started.

Reconstruction Finance Corporation Urged

(Concluded from page 1637)

now earning fixed charges. It has been explained also, from other sources, that some of the larger lines allied with the smaller ones are able to take care of the latter, and that bankers have promised help. Moreover, it has been pointed out in railroad circles that only about \$70,000,000 in railroad bonds will mature in 1932, the smallest for a long period.

Rail Wage Cut to Save \$200,000,000

Further optimism as to the railroad situation developed when Daniel Willard called at the White House last Friday and is said to have told the President that pending wage negotiations would be worked out successfully. It is estimated that a 10 per cent reduction in wages would mean a saving of \$200,000,000 annually to the railroads, and added to this will come increased revenue arising from the Interstate Commerce Commission decision in the 15 per cent case. Increased rates approved by the commission are estimated to provide from \$100,000,000 to \$125,000,000 annually.

Meanwhile, after passing the moratorium resolution, the House acted on another administration measure by voting an addition of \$100,000,000 to the capital of the Federal Farm Land banks and gave the banks discretionary power to postpone payments by farmers of installments on loans. It voted down a proposed general moratorium on debts due land banks. The increased capitalization for the Farm Land banks is intended to stimulate the value of farm land bank bonds which amount to \$1,172,478,700. At present, the Farm Land bank capitalization is \$65,000,000. These banks hold first mortgages on farms valued at \$1,171,699,700. It is the expectation of the administration that, with increased capitalization, the banks will retire some of their maturing bonds to float additional securities,

be able to carry delinquent borrowers and to advance loans to farmers offering sound security.

The moratorium resolution suspends for one year payments of \$250,000,000 owing the United States by Europe. The resolution carried a section strongly opposing reduction or cancellation of post-war debts.

On the Senate side also, hearings were ended last Saturday on the bill of Senator LaFollette of Wisconsin to establish a so-called National Economic Council for proposed long range business planning. Senator LaFollette announced that he would soon call together the Senate Committee on manufactures to consider final drafting of the measure.

Railroads To Hasten New Rate Schedule

WASHINGTON, Dec. 22.—The Association of Railway Executives has announced that every effort will be made to put into effect Jan. 1 the increased freight rates granted by the Interstate Commerce Commission in its decision on the 15 per cent rate case.

Detroit Scrap Market Weak; Prices Decline

DETROIT, Dec. 22.—With scrap buying virtually at a standstill, many items, including heavy melting steel, have declined 25c. a ton. Dealers look for only slight, if any, improvement in the next 30 days. The local steel plant temporarily has held up shipments on current contracts.

Agency Appointments and New Offices

Gears & Forgings, Inc., Cleveland, has appointed the following distributors for its products in the respective districts: Terre Haute Heavy Hardware Co., Inc., Terre Haute, Ind.; Ross-Willoughby Co., Columbus, Ohio; Koontz-Wagner Electric Co., South Bend, Ind.; Stambaugh-Thompson Co., Youngstown, Ohio, and Hardware & Supply Co., Akron, Ohio.

Charles A. Schieren Co., 30-38 Ferry Street, New York, has removed its Boston branch to 186 Lincoln Street.

Bunting Brass & Bronze Co., Toledo, Ohio, has established branch offices and warehouses at 1729 First Avenue, Seattle, Wash., and at 447 East Fort Street, Detroit.

Lincoln Electric Co., Cleveland, has removed its New York office from 136 Liberty Street to the McGraw-Hill Building, 330 West Forty-second Street. G. N. Bull continues as New York district manager. Branch offices, which have been established in Scranton and Allentown, Pa., are in charge of D. Levenson and F. Shackleton respectively.

Northern Equipment Co., Erie, Pa., has appointed Irving M. Day, 306 Chandler Building, Washington, as its representative in that city, and G. L. Simonds, Winter Haven, Fla., as its Florida representative.

World Copper Output at 26½ Per Cent; Lead Active; Zinc and Tin Quiet

NEW YORK, Dec. 22.—Reduction of world copper output to 26½ per cent of capacity, effective Jan. 1, has been announced by Copper Exporters, Inc., which represents about 90 per cent of world capacity. Curtailment is for an indefinite period, but it is agreed that after Dec. 31, 1932, any company may withdraw on 30 days notice. Also, reduction in world output will cease to be effective if the price of copper in the domestic market shall exceed 12c. a lb. for 15 days, or if total stocks above ground shall not equal aggregate deliveries in the preceding four months. Prior to the present depression, the lowest price reached by copper in this century was 12c. a lb.

Certain rules and regulations of Copper Exporters, Inc., are being revised and will be filed with the Federal Trade Commission shortly. With these rules in effect, the new Rhodesian producers and certain Canadian and South American mines are expected to become members. Another development of the week is the decision of the Phelps-Dodge Corp. not to withdraw from membership in Copper Exporters, Inc.

Prior to public announcement of world curtailment of copper output, the market developed considerable strength. Offerings by custom smelters advanced from 6.50c., delivered, on Dec. 16, to 7c., delivered, on Dec. 17, and to a minimum of 7.25c. on Dec. 18. On the latter date the price of Copper Exporters, Inc., was advanced from 7c. to 7.50c. a lb., delivered usual European ports, and primary producers increased their quotations to 7.25c., delivered Connecticut Valley.

Domestic electrolytic copper sales were moderately active prior to the latest advance, mostly for early second quarter delivery. Certain producers are endeavoring to reduce forward selling to the former limit of three months. Export has been heavy in the week, sales exceeding 15,000 tons, and bringing the total for the month, including Dec. 22, to more than 24,000 tons. Lake copper is in moderate demand, and the price is firm at 7.37½c., delivered.

Tin

Because of inventory taking and generally low consumption of tin by domestic users, the market here has been decidedly inactive in the past week. Fluctuation of the price from 21.62½c. on Dec. 16, to 21.12½c. on Dec. 18, to 21.70c. yesterday and

21.87½c., today, was caused by a strong situation in the London market, where demand has been considerably more active and sales have been made for early January delivery. The London price today is £141 17s. 6d. for spot standard, £144 17s. 6d. for future standard, £144 12s. 6d. for spot Straits, and £146 17s. 6d. for shipment from Singapore.

It has been announced by the committee of control of the International Tin Pool that about 19,000 tons of tin is now being held, all of the holdings appearing in statements of visible supplies. Participating governments have agreed to remain in the plan for tin control for a period of three years from Aug. 12, 1931, and the minimum price at which the pool will begin liquidation of its holdings has been advanced from the former £150 a ton to £165. At this higher level, an initial 5 per cent of holdings will be offered for sale, provided this has been the average price on the London Metal Exchange in any complete calendar month. The pool will then release an

additional 10 per cent when the average price reaches £176 a ton.

Stocks of tin in United Kingdom warehouses on Dec. 21 are down 105 tons to a total of 30,693 tons.

Lead

While prices are unchanged at 3.75c., New York, and 3.55c., St. Louis, demand has been increasingly active in the past week, with cable makers covering for January delivery. Part of this movement is attributed by sellers to buying of cable by public utilities just prior to advances in the copper market, and part to the fact that curtailment of copper output will affect lead production, as the latter is a by-product with some copper mines.

Zinc

Transactions in zinc have been small, reflecting lack of consumption in the galvanizing industry. Zinc, however, is statistically in as satisfactory a position as any of the metals. Prices are unchanged at 3.50c., New York, and 3.15c., East St. Louis.

The Week's Prices. Cents Per Pound for Early Delivery

	Dec. 22	Dec. 21	Dec. 19	Dec. 18	Dec. 17	Dec. 16
Lake copper, New York.....	7.37½	7.37½	7.37½	7.37½	7.37½	7.37½
Electrolytic copper, N. Y.*.....	7.00	7.00	7.00	7.00	6.75	6.25
Straits tin, spot, N. Y.....	21.87½	21.70	21.70	21.12½	21.62½	21.62½
Zinc, East St. Louis.....	3.15	3.15	3.15	3.15	3.15	3.15
Zinc, New York.....	3.50	3.50	3.50	3.50	3.50	3.50
Lead, St. Louis.....	3.55	3.55	3.55	3.55	3.55	3.55
Lead, New York.....	3.75	3.75	3.75	3.75	3.75	3.75

*Refinery quotation; price ¼c. higher delivered in the Connecticut Valley.
Aluminum, 98 to 99 per cent pure, 22.90c. a lb., delivered.
Nickel, electrolytic cathode, 35c. a lb., delivered; shot and ingot, 36c. a lb., delivered.
Antimony, 6.25c. a lb., New York.

From New York Warehouse

Delivered Prices, Base per Lb.	
Tin, Straits pig.....	23.25c. to 24.25c.
Tin, bar.....	25.25c. to 27.25c.
Copper, Lake.....	8.50c. to 9.50c.
Copper, electrolytic.....	8.25c. to 9.25c.
Copper, casting.....	8.00c. to 9.00c.
*Copper sheets, hot-rolled.....	16.37½c.
*High brass sheets.....	13.25c.
*Seamless brass tubes.....	16.50c.
*Seamless copper tubes.....	15.87½c.
*Brass rods.....	11.00c.
*Brazed brass tubes.....	22.00c.
Zinc, slab.....	4.75c. to 5.25c.
Zinc sheets (No. 9), casks.....	9.25c. to 9.50c.
Lead, American pig.....	4.62½c. to 5.12½c.
Lead, bar.....	6.37½c. to 7.37½c.
Lead sheets.....	8.25c.
Antimony, Asiatic.....	9.00c. to 10.00c.
Alum., virgin, 99 per cent plus.....	23.30c.
Alum. No. 1 for remelt-ing, 98 to 99 per cent.....	17.00c. to 18.00c.
Solder, ½ and ¼.....	15.25c. to 16.25c.

*These prices are also for delivery from Chicago and Cleveland warehouses.

Metals from Cleveland Warehouse

Delivered Prices per Lb.	
Tin, Straits pig.....	26.50c.
Tin, bar.....	28.50c.
Copper, Lake.....	8.37½c.

Copper, electrolytic.....	8.37½c.
Copper, casting.....	8.00c.
Zinc, slab.....	4.75c. to 5.00c.
Lead, American pig.....	4.30c. to 4.50c.
Lead, bar.....	7.75c.
Antimony, Asiatic.....	10.00c.
Babbitt metal, medium grade.....	15.00c.
Babbitt metal, high grade.....	20.50c.
Solder, ½ and ¼.....	18.50c.

Old Metals, Per Lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators, and selling prices are those charged to consumers after the metal has been prepared for their uses. (All prices are nominal.)

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	5.50c.	6.25c.
Copper, hvy. and wire	5.25c.	6.00c.
Copper, light and bot-toms.....	4.25c.	5.00c.
Brass, heavy.....	2.75c.	3.50c.
Brass, light.....	2.25c.	3.00c.
Hvy. machine compo-sition.....	4.25c.	5.00c.
No. 1 yel. brass turn-ings.....	3.25c.	3.75c.
No. 1 red brass or compos. turnings...	3.75c.	4.50c.
Lead, heavy.....	2.75c.	3.125c.
Zinc.....	1.25c.	1.75c.
Cast aluminum.....	3.25c.	5.00c.
Sheet aluminum.....	9.00c.	11.00c.

Prices of Finished and Semi-Finished Steel, BARS, PLATES, SHAPES

Iron and Steel Bars

Soft Steel		Base per Lb.
F.o.b. Pittsburgh mill	.....	1.60c.
F.o.b. Chicago	.....	1.60c. to 1.70c.
Del'd Philadelphia	.....	1.89c.
Del'd New York	.....	1.93c.
F.o.b. Cleveland	.....	1.65c.
F.o.b. Lackawanna	.....	1.70c.
F.o.b. Birmingham	.....	1.70c.
C.i.f. Pacific ports	.....	2.00c.

Billet Steel Reinforcing		Base per Lb.
F.o.b. P'gh mills, 40, 50, 60-ft.	.....	1.60c.
F.o.b. Birmingham, mill lengths	.....	1.75c.
F.o.b. Cleveland	.....	1.40c. to 1.50c.

Rail Steel		Base per Lb.
F.o.b. mills, east of Chicago dist.	.....	1.30c. to 1.35c.
F.o.b. Chicago Heights mill	.....	1.50c. to 1.60c.
Del'd Philadelphia	.....	1.49c. to 1.59c.

Iron		Base per Lb.
Common iron, f.o.b. Chicago	.....	1.60c. to 1.70c.
Refined iron, f.o.b. P'gh mills	.....	2.75c.
Common iron, del'd Philadelphia	.....	2.09c.
Common iron, del'd New York	.....	2.14c.

Tank Plates

Base per Lb.	
F.o.b. Pittsburgh mill	..... 1.50c. to 1.60c.
F.o.b. Chicago	..... 1.60c. to 1.70c.
F.o.b. Birmingham	..... 1.70c.
Del'd Cleveland	..... 1.78 1/2c.
Del'd Philadelphia	..... 1.73 1/2c.
F.o.b. Cortesville	..... 1.60c. to 1.70c.
F.o.b. Sparrows Point	..... 1.60c. to 1.70c.
F.o.b. Lackawanna	..... 1.60c. to 1.70c.

Sheets

Hot-Rolled		Base per Lb.
No. 10, f.o.b. Pittsburgh	.....	1.60c. to 1.70c.
No. 10, f.o.b. Chicago mills	.....	1.70c. to 1.80c.
No. 10, del'd Philadelphia	.....	1.94c. to 1.99c.
No. 10, f.o.b. Birmingham	.....	1.85c.
No. 10, c.i.f. Pacific Coast ports	.....	2.33c.

Hot-Rolled and Annealed		Base per Lb.
No. 10, Pittsburgh	.....	1.75c. to 1.85c.
No. 10, Chicago mills	.....	1.85c. to 1.95c.
No. 10, Birmingham	.....	2.00c.

Hot-Rolled Annealed		Base per Lb.
No. 24, f.o.b. Pittsburgh	.....	2.25c. to 2.40c.
No. 24, f.o.b. Chicago mills	.....	2.35c. to 2.50c.
No. 24, del'd Philadelphia	.....	2.59c. to 2.69c.
No. 24, f.o.b. Birmingham	.....	2.55c.
No. 24, c.i.f. Pacific Coast ports	.....	2.88c.

Heavy Cold-Rolled		Base per Lb.
No. 10 gage, f.o.b. Pittsburgh	.....	2.25c. to 2.35c.
No. 10 gage, f.o.b. Chicago mills	.....	2.35c. to 2.45c.
No. 10 gage, del'd Philadelphia	.....	2.54c. to 2.64c.

Light Cold-Rolled		Base per Lb.
No. 20 gage, f.o.b. Pittsburgh	.....	2.85c. to 2.95c.
No. 20 gage, f.o.b. Chicago mills	.....	2.90c. to 3.05c.
No. 20 gage, del'd Philadelphia	.....	3.14c. to 3.24c.

Automobile Body Sheets		Base per Lb.
No. 20, f.o.b. Pittsburgh	.....	3.09c.

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills					
Butt Weld					
Inches	Steel	Galv.	Inches	Iron	Galv.
1 1/2	47	21 1/2	1 1/2 and 3/4	+11	+36
1 1/4	53	27 1/2	1 1/2	23	5
1 1/8	58	44 1/2	3/4	28	11
3/4	62	50 1/2	1 and 1 1/4	31	15
1 to 3	64	52 1/2	1 1/2 and 2	35	18

Lap Weld					
2	57	45 1/2	2	23	9
2 1/2 to 6	61	49 1/2	2 1/2 to 3 1/2	28	13
7 and 8	58	45 1/2	4 to 6	30	17
9 and 10	56	43 1/2	7 and 8	29	16
11 and 12	55	42 1/2	9 to 12	26	11

Butt Weld, extra strong, plain ends					
1 1/2	43	26 1/2	1 1/2 and 3/4	+13	+48
1 1/4	49	32 1/2	1 1/2	23	7
1 1/8	55	44 1/2	3/4	28	12
3/4	60	49 1/2	1 to 2	34	18
1 to 1 1/2	62	51 1/2			
2 to 3	63	52 1/2			

Lap Welds, extra strong, plain ends					
2	55	44 1/2	2	29	13
2 1/2 to 4	59	48 1/2	2 1/2 to 4	34	20
4 1/2 to 6	58	47 1/2	4 1/2 to 6	33	19
7 to 8	54	44 1/2	7 and 8	31	17
9 and 10	47	34 1/2	9 to 12	21	8
11 and 12	46	33 1/2			

On carloads the above discounts on steel pipe are increased on black by one point, with sup-

Del'd New York	.....	1.78c. to 1.88c.
C.i.f. Pacific ports	.....	1.80c. to 1.85c.

Structural Shapes

Base per Lb.	
F.o.b. Pittsburgh mill	..... 1.50c. to 1.60c.
F.o.b. Chicago	..... 1.60c. to 1.70c.
F.o.b. Birmingham	..... 1.70c.
F.o.b. Lackawanna	..... 1.60c. to 1.70c.
F.o.b. Bethlehem	..... 1.68 1/2c. to 1.78 1/2c.
Del'd Philadelphia	..... 1.64 1/2c. to 1.69 1/2c.
Del'd New York	..... 1.75 1/2c. to 1.85 1/2c.
C.i.f. Pacific ports (standard)	..... 2.05c.
C.i.f. Pacific ports (wide flange)	..... 2.15c.

Alloy Steel Bars

Alloy Quantity Bar Base, 2.65c. per Lb.		Alloy Differential per 100 Lb.
S.A.E. Series	Numbers	
2000 (1 1/2% Nickel)	.....	\$0.25
2100 (1 1/2% Nickel)	.....	0.55
2300 (3 1/2% Nickel)	.....	1.50
2500 (5% Nickel)	.....	2.25
3100 Nickel Chromium	.....	0.55
3200 Nickel Chromium	.....	1.35
3500 Nickel Chromium	.....	3.80
3400 Nickel Chromium	.....	3.20
4100 Chromium Molybdenum (0.15 to 0.25 Molybdenum)	.....	0.50
4100 Chromium Molybdenum (0.25 to 0.40 Molybdenum)	.....	0.70
4600 Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.25 to 1.75 Nickel)	.....	1.05

SHEETS, STRIP, TIN PLATE, TERNE PLATE

Steel Furniture Sheets

No. 10, f.o.b. Pittsburgh	.....	2.65c. to 2.75c.
No. 20, f.o.b. Pittsburgh	.....	3.25c. to 3.35c.

(Prices on furniture stock include stretcher leveling but not resquaring.)

Galvanized Sheets

No. 24, f.o.b. Pittsburgh	.....	2.80c. to 2.90c.
No. 24, f.o.b. Chicago mills	.....	2.90c. to 3.00c.
No. 24, del'd Philadelphia	.....	3.09c. to 3.19c.
No. 24, f.o.b. Birmingham	.....	2.95c. to 3.05c.
No. 24, c.i.f. Pacific Coast ports	3.38c.

Long Ternes

No. 24, unassorted, 8-lb. coating, f.o.b. P'gh	2.95c. to 3.00c.
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Vitreous Enamelling Stock

No. 10, f.o.b. Pittsburgh	2.75c.
No. 20, f.o.b. Pittsburgh	3.25c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	.....	2.65c.
No. 28, Chicago mills	.....	2.75c.

Tin Plate

Base per Box	
Standard cokes, f.o.b. P'gh district mills	..... \$4.75
Standard cokes, f.o.b. Gary	..... 4.85

5100 Chromium Steel (0.60 to 0.90 Chromium)	.....	0.35
5100 Chromium Steel (0.80 to 1.10 Chromium)	.....	0.45
5100 Chromium Spring Steel	.....	0.20
6100 Chromium Vanadium Bar	.....	1.20
6100 Chromium Vanadium Spring Steel	.....	0.95
9250 Silicon Manganese Spring Steel (flats)	.....	0.25
Rounds and squares	.....	0.50
Chromium Nickel Vanadium	.....	1.50
Carbon Vanadium	.....	0.95

Above prices are for hot-rolled steel bars, forging quality. The differential for cold-drawn bars is 3/4c. a lb. higher, with standard classification for cold-finished alloy steel bars applying. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis.

Billets under 4 x 4 in. carry the steel bar base. Slabs with a section area of 16 in. or over carry the billet price. Slabs with sectional area of less than 16 in. or less than 2 1/2 in. thick, regardless of sectional area, take the bar price.

Cold-Finished Bars

Base per Lb.	
Bars, f.o.b. Pittsburgh mill	..... 2.00c.
Bars, f.o.b. Chicago	..... 2.00c.
Bars, Cleveland	..... 2.00c.
Bars, Buffalo	..... 2.00c.
Shafting, ground, f.o.b. mill	..... *2.35c. to 3.30c.

*According to size.

Terne Plate

(F.o.b. Morgantown or Pittsburgh)	
(Per Package, 20 x 28 in.)	
8-lb. coating I.C. \$9.50	25-lb. coating I.C. \$14.10
15-lb. coating I.C. 12.00	30-lb. coating I.C. 14.90
20-lb. coating I.C. 13.00	40-lb. coating I.C. 16.70

Hot-Rolled Hoops, Bands and Strips

Base per Lb.	
6 in. and narrower, Pittsburgh	..... 1.60c.
Wider than 6 in., P'gh	..... 1.50c.
6 in. and narrower, Chicago	..... 1.70c.
Wider than 6 in., Chicago	..... 1.60c.
Cooperage stock, 1 1/2 in.	..... 1.70c. to 1.80c.
Cooperage stock, Chicago	..... 1.80c. to 1.90c.

Cold-Rolled Strips

F.o.b. P'gh	..... 2.00c. to 2.10c.
F.o.b. Cleveland	..... 2.00c. to 2.10c.
F.o.b. del'd Chicago	..... 2.35c.
F.o.b. Worcester	..... 2.20c.
Fender stock, No. 20 gage, Pittsburgh or Cleveland	..... 3.00c.

STEEL PIPE AND TUBING

ment ry discounts of 5 and 2 1/2%, and on galvanized by 1 1/2 points with supplementary discounts of 5 and 2 1/2%. On iron pipe, both black and galvanized, the above discounts are increased to jobbers by one point with supplementary discounts of 5 and 2 1/2%.

Note.—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2 1/2 points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh	
Steel	Charcoal Iron
2 in. and 2 1/4 in. 38	1 1/2 in. 1
2 1/2 in. 23 1/2	1 3/4 in. 8
3 in. 12	2 in. 13
3 1/4 in. 5 1/2	2 1/2 in. 16
4 in. 5	3 in. 17
4 1/2 in. to 6 in. 46	3 1/4 in. to 3 1/2 in. 18
	4 in. 20
	4 1/2 in. 21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

Standard Commercial Seamless Boiler Tubes

Cold Drawn	
1 in. 61	3 in. 46
1 1/4 to 1 1/2 in. 53	3 1/4 to 3 1/2 in. 48
1 3/4 in. 37	4 in. 51
2 to 2 1/4 in. 32	4 1/2, 5 and 6 in. 40
2 1/2 to 2 3/4 in. 40	

Hot Rolled

2 and 2 1/4 in. 38	3 1/4 to 3 1/2 in. 54
2 1/2 and 2 3/4 in. 46	4 in. 57
3 in. 52	4 1/2, 5 and 6 in. 46

Beyond the above base discounts a preferential discount of 5 per cent is allowed on carload lots. On less than carloads to 10,000 lb., base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb., base discounts are reduced 6 points, with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. and lighter than standard gages take the mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

Per Cent Off List	
Carbon, 0.10% to 0.30% base (carloads)	..... 55
Carbon, 0.30% to 0.40% base	..... 50
Plus differential for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.	

Bolts, Nuts, Coke, Coal, Fuel Oil, Cast Iron Pipe

WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh and Cleveland)
(After Dec. 31, extras of 10c. a 100 lb. on mixed
and joint carloads, 25c. on pool carloads and 40c.
on less than carloads will be applied on all mer-
chant wire products.)

To Manufacturing Trade	
Bright wire	2.20c.
Spring wire	3.20c.
To Jobbing Trade	
Standard wire nails	Base per Kea \$1.90 to \$1.95

Smooth coated nails	1.90 to 1.95
Galvanized nails	3.90
Base per Lb.	
Smooth annealed wire	2.35c.
Smooth galvanized wire	2.80c.
Polished staples	2.35c. to 2.50c.
Galvanized staples	2.60c. to 2.75c.
Barbed wire, galvanized	2.55c. to 2.60c.

Woven wire fence, Nos. 9 and 11 gage,	per net ton	\$55.00
Woven wire fence, No. 12½ gage and	lighter, per net ton	60.00
Anderson, Ind., mill prices are ordinarily		
\$1 a ton over Pittsburgh base; Duluth		
Minn., and Worcester, Mass., mill \$2 a ton		
over Pittsburgh, and Birmingham mill \$3 a		
ton over Pittsburgh.		

RAILS AND TRACK SUPPLIES

Rails	Per Gross Ton
Standard, f.o.b. mill	\$43.00
Light (from billets), f.o.b. mill	34.00
Light (from rail steel), f.o.b. mill	32.00

Track Equipment	Base per 100 Lb.
Spikes, ½-in. and larger	\$2.60
Spikes, ¾-in. and larger	2.60
Spikes, bent and barge	2.55

Tie plate, steel.....	1.85
Angle bars.....	2.75
Track bolts, to steam railroads.....	3.50
Track bolts, to jobbers, all sizes, per 100 count.....	75 per cent off list

BOLTS, NUTS RIVETS AND SET SCREWS

Bolts and Nuts	
(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)	
	Per Cent Off List
†Machine bolts	73, 10 and 10
†Carriage bolts	73, 10 and 10
Lag bolts	73, 10 and 10
Plow bolts, Nos. 1, 2, 3 and 7 heads, 73, 10 and 10	
Hot-pressed nuts, blank or tapped, square,	73, 10 and 10
Hot-pressed nuts, blank or tapped, hexagons,	73, 10 and 10
C.p.c. and t. square or hex. nuts, blank or tapped	73, 10 and 10
Washers*	7.00c. to 6.75c. per lb. off list

Bolts and Nuts	
Semi-finished hexagon nuts	
Semi-finished hexagon castellated nuts, S.A.E.	
Stove bolts in packages, P'gh	80, 25 and 10
Stove bolts in packages, Ch'go	80, 25 and 10
Stove bolts in pkgs., Cleveland	80, 25 and 10
Stove bolts in bulk, P'gh	80, 25, 10 and 2½
Stove bolts in bulk, Ch'go	80, 25, 10 and 2½
Stove bolts in bulk, Cleveland	80, 25, 10 and 2½
Tire bolts	60, 10 and 10
Discounts of 73, 10 and 10 per cent off on bolts and nuts apply on carload business with jobbers and large consumers.	

Small Rivets	
(½-in. and smaller)	
Per Cent Off List	
F.o.b. Pittsburgh	70, 10 and 5
F.o.b. Cleveland	70, 10 and 5
F.o.b. Chicago	70, 10 and 5

Cap and Set Screws	
(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)	
Per Cent Off List	
Milled cap screws	80, 10, 10 and 5
Milled standard set screws, case hardened	80 and 5
Milled headless set screws, cut thread	75 and 10
Upset hex. head cap screws, U.S.S. thread	85 and 10
Upset hex. cap screws, S.A.E. thread	85 and 10
Upset set screws	80, 10 and 5
Milled studs	70

*F.o.b. Chicago, New York and Pittsburgh.
†Bolts with rolled thread up to and including ¾ in. x 6 in. take 10 per cent lower list prices.

Large Rivets	
(½-in. and larger)	
Base per 100 Lb.	
F.o.b. Pittsburgh or Cleveland	\$2.25
F.o.b. Chicago	2.35

SEMI-FINISHED STEEL

Billets and Blooms	
	<i>Per Gross Ton</i>
Rerolling, 4-in. and under 10-in., Pitts- burgh	\$29.00
Rerolling, 4-in. and under 10-in., Youngs- town	29.00
Rerolling, 4-in. and under 10-in., Cleve- land	29.00
Rerolling, 4-in. and under 10-in., Chicago	31.00
Forging quality, Pittsburgh	35.00

Sheet Bars	
(Open-Hearth or Bessemer)	
Per Gross Ton	
Pittsburgh	\$29.00
Youngstown	29.00
Cleveland	29.00
Slabs	
(8 in. x 2 in. and under 10 in. x 10 in.)	
Per Gross Ton	
Pittsburgh	\$29.00
Youngstown	29.00
Cleveland	29.00

Skelp	
(F.o.b. Pittsburgh or Youngstown)	
Per Lb.	
Grained	1.50c. to 1.60c.
Universal	1.50c. to 1.60c.
Sheared	1.50c. to 1.60c.

Wire Rods	
(Common soft, base)	
Per Gross Ton	
Pittsburgh	\$35.00 to \$37.00
Cleveland	35.00 to 37.00
Chicago	36.00 to 38.00

Coke		Per Net Ton
Furnace, f.o.b. Connellsville prompt		\$2.25 to \$2.35
Foundry, f.o.b. Connellsville prompt		3.25 to 4.50
Foundry, by-product, Ch'go ovens		7.50
Foundry, by-product, New England, del'd		10.50
Foundry, by-product, Newark or Jersey City, delivered		8.70 to 9.10

COKE, COAL AND FUEL OIL

Foundry, by-product, Phila.....	29.00
Foundry, Birmingham	5.00
Foundry, by-product, St. Louis, f.o.b. ovens	8.00
Foundry, by-product, del'd St. Louis	9.00

Coal		Per Net Ton
Mine run steam coal, f.o.b. W. Pa.	mines	\$1.40 to \$1.50
Mine run coking coal, f.o.b. W. Pa.		1.50 to 1.60

Gas coal, ½-in., f.o.b. Pa. mines	\$1.70 to \$1.80
Mine run gas coal, f.o.b. Pa. mines	1.50 to 1.60
Steam slack, f.o.b. W. Pa. mines	0.50 to 0.60
Gas slack, f.o.b. W. Pa. mines	0.45 to 0.75

Fuel Oil	
Per Gal. f.o.b. Bayonne, N. J.	
No. 3 distillate	3.50c.
No. 4 industrial	3.00c.
Per Gal. f.o.b. Baltimore	
No. 3 distillate	3.50c.
No. 4 industrial	3.25c.

FLUXES AND REFRACTORIES

Fluorspar		Per Net Ton
Domestic, 85% and over calcium fluoride, not over 5% silicon, gravel, f.o.b. Illinois and Kentucky mines.....		\$13.00
No. 2 lump, Illinois and Kentucky mines.....		17.00
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic port, duty paid.....		17.00
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines.....		32.00
Chrome Brick		Per Net Ton
Standard size		\$45.00

Fire Clay Brick			
	Per 1000 f.o.b. Works		
	High-Heat Duty Brick	Intermediate Heavy Duty Brick	
Pennsylvania	\$40.00	\$32.00 to \$35.00	
Maryland	40.00	32.00 to 35.00	
New Jersey.....	\$44.00 to 59.00	.....
Ohio	40.00	32.00 to 35.00	
Kentucky	40.00	32.00 to 35.00	
Missouri	37.00	32.00 to 35.00	
Illinois	40.00	32.00 to 35.00	
Ground fire clay, per ton.....	6.50		

Silica Brick	
Per 1000 f.o.b. Works	
Pennsylvania	\$46.00
Chicago	49.00
Birmingham	50.00
Silica clay, per ton	8.00

Magnesite Brick		Per Net Ton
Standard sizes, f.o.b. Baltimore and Chester, Pa.		\$65.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.		40.00

CAST IRON PIPE

Per Net Ton	
6-in. and larger, del'd Chicago	\$40.00 to \$42.00
4-in., del'd Chicago	43.00 to 45.00

6-in. and larger, del'd New York	\$32.90
4-in., del'd New York	35.90
6-in. and larger, Birmingham	\$32.00 to 33.00

4-in., Birmingham	\$35.00 to \$36.00
Class "A" and gas pipe, \$3 extra.	

▲ ▲ ▲ Pig Iron Prices for All Districts ▲ ▲ ▲

▶ VALLEY ◀

Per gross ton, f.o.b. Valley furnace:

Basic	\$15.00
Bessemer	\$16.00 to 16.50
Gray forge	15.50 to 16.00
No. 2 foundry	15.50 to 16.00
No. 3 foundry	15.00 to 15.50
Malleable	16.00 to 16.50
Low phos., copper free	26.66 to 27.00

Freight rate to Pittsburgh or Cleveland district, \$1.76.

▶ PITTSBURGH ◀

Per gross ton, f.o.b. Pittsburgh district furnace:

Basic	\$15.50
No. 2 foundry	16.50 to 17.00
No. 3 foundry	16.00 to 16.50
Malleable	16.50 to 17.00
Bessemer	16.50 to 17.00

Freight rates to points in Pittsburgh district range from 63c. to \$1.13.

▶ CHICAGO ◀

Per gross ton at Chicago furnace:

N'th'n No. 2 fdy.	\$16.50
N'th'n No. 1 fdy.	17.00
Malleable, not over 2.25 sil.	16.50
High phosphorus	16.50
Lake Super. charcoal, sil.	
1.50, by rail	23.04
Lake Super. charcoal, sil.	
1.50, Chicago docks	17.00
S'th'n No. 2 fdy.	17.01
Low phos., sil. 1 to 2, copper free	\$28.50 to 29.20
Silvery, sil. 8 per cent.	24.79
Bess. ferrosilicon, 14-15%	31.29

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnaces, not including an average switching charge of 61c. per gross ton.

▶ ST. LOUIS ◀

Per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25 f.o.b.	
Granite City, Ill.	\$17.50
Malleable, f.o.b. Granite City	17.50
N'th'n No. 2 fdy., del'd St. Louis	18.66
Southern No. 2 fdy., del'd	15.42
Northern malleable, del'd	18.66
Northern basic, del'd	18.66

Freight rates 75c. (average) Granite City to St. Louis; \$2.16 from Chicago; \$4.42 from Birmingham.

▶ NEW YORK ◀

Per gross ton, delivered New York district:

*Buffalo, No. 2, del'd east.	
N. J.	\$17.78 to \$18.28
East. Pa. No. 2 fdy.	16.89 to 17.39
East. Pa. No. 2X fdy.	17.89 to 18.39

Freight rates: \$1.39 to \$2.52 from eastern Pennsylvania.

*Prices delivered to New Jersey cities having rate of \$3.28 a ton from Buffalo.

▶ BUFFALO ◀

Per gross ton, f.o.b. furnace:

No. 2 fdy.	\$17.00
No. 2X fdy.	17.50
No. 1 fdy.	18.50
Malleable, sil. up to 2.25	17.50
Basic	17.00
Lake Superior charcoal	25.28

▶ NEW ENGLAND ◀

Per gross ton delivered to most New England points:

*Buffalo, sil. 1.75 to 2.25	\$19.91
*Buffalo, sil. 2.25 to 2.75	19.91
*Ala., sil. 1.75 to 2.25	\$20.11 to 20.61
*Ala., sil. 2.25 to 2.75	20.61 to 21.11
†Ala., sil. 1.75 to 2.25	16.75
†Ala., sil. 2.25 to 2.75	17.25

Freight rates: \$4.91 all rail and \$4.28 rail and water from Buffalo; \$9.61 all rail from Alabama and \$5.75 rail and water from Alabama to New England seaboard.

*All rail rate.
†Rail and water rate.

▶ CINCINNATI ◀

Per gross ton, delivered Cincinnati:

Ala. fdy., sil. 1.75 to 2.25	\$14.65
Ala. fdy., sil. 2.25 to 2.75	15.19
Tenn. fdy., sil. 1.75 to 2.25	14.69
N'th'n No. 2 foundry	17.90
S'th'n Ohio silvery, 8 per cent.	21.89

Freight rates, \$1.89 from Ironton and Jackson, Ohio; \$3.69 from Birmingham.

▶ PHILADELPHIA ◀

Per gross ton at Philadelphia:

East. Pa. No. 2	\$15.51 to \$16.01
East. Pa. No. 2X	16.01 to 16.51
East. Pa. No. 1X	16.51 to 17.01
Basic (del'd east. Pa.)	16.25
Malleable	18.50 to 19.00
Stand. low phos. (f.o.b. east. Pa. furnace)	22.00 to 23.00
Cop. b'r'g low phos. (f.o.b. furnace)	22.00 to 22.50
Va. No. 2 plain	22.04
Va. No. 2X	22.54

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 76c. to \$1.64 from eastern Pennsylvania furnaces; \$4.54 from Virginia furnaces.

▶ CLEVELAND ◀

Per gross ton at Cleveland furnace:

N'th'n No. 2 fdy. (local delivery)	\$16.00
S'th'n fdy., sil. 1.75 to 2.25	17.01
Malleable (local delivery)	16.00
Ohio silvery, 8 per cent.	23.00
Stand. low phos., Valley	27.00

Prices are f.o.b. furnace except on Southern foundry and silvery iron. Freight rates: 50c. average local switching charge; \$3 from Jackson, Ohio; \$6.01 from Birmingham.

▶ BIRMINGHAM ◀

Per gross ton, f.o.b. Birmingham dist. furnaces:

No. 2 fdy., 1.75 to 2.25 sil.	\$12.00
No. 1 fdy., 2.25 to 2.75 sil.	12.50
Basic	12.00

▶ CANADA ◀

Per gross ton:

Delivered Toronto	
No. 1 fdy., sil. 2.25 to 2.75	\$22.60
No. 2 fdy., sil. 1.75 to 2.25	22.10
Malleable	22.60

Delivered Montreal	
No. 1 fdy., sil. 2.25 to 2.75	\$24.00
No. 2 fdy., sil. 1.75 to 2.25	23.50
Malleable	24.00
Basic	\$23.00 to 23.50

▲ ▲ ▲ Prices of Ores and Ferroalloys ▲ ▲ ▲

Ores

Lake Superior Ores, Delivered Lower Lake Ports

	Per Gross Ton
Old range Bessemer, 51.50% iron	\$4.80
Old range non-Bessemer, 51.50% iron	4.65
Mesabi Bessemer, 51.50% iron	4.65
Mesabi non-Bessemer, 51.50% iron	4.50
High phosphorus, 51.50% iron	4.40

Foreign Ore, c.i.f. Philadelphia or Baltimore

	Per Unit
Iron, low phos., copper free, 55 to 58% iron, dry, Spanish or Algerian	8c. to 8.50c.
Iron, low phos., Swedish, aver. 68% iron	9.00c.
Iron, basic or foundry, Swedish, average 65% iron	8.00c.
Iron, basic and foundry, Russian, average 63% iron (nom.)	9.00c.
Manganese, Caucasian, washed 52%	24.00c.
Manganese, African, Indian, 50-52%	23c. to 24c.
Manganese, Brazilian, 46 to 48%	22c. to 23c.
Tungsten, Chinese wolframite	\$11.00 to \$11.25
Tungsten, domestic scheelite	9.50 to 10.00

Per Gross Ton

Chrome, 45% Cr ₂ O ₃ , crude, c.i.f. Atlantic seaboard	\$18.00
Chrome, 48% Cr ₂ O ₃ , c.i.f. Atlantic seaboard	20.00

Ferromanganese

	Per Gross Ton
Domestic, 80%, seaboard	\$72.00 to \$75.00
Foreign, 80%, Atlantic or Gulf port, duty paid	*72.00 to 75.00

*Minimum price quoted for lots of 2000 tons or more.

Spiegeleisen

	Per Gross Ton Furnace
Domestic, 19 to 21%	\$26.00 to \$27.00

Electric Ferrosilicon

	Per Gross Ton Delivered
50% (carload)	\$77.50
50% (less carload)	85.00
75%	126.00

	Per Gross Ton Furnace	Per Gross Ton Furnace
10%	\$35.00	12% \$39.00
11%	37.00	14 to 16% 31.00

Bessemer Ferrosilicon

	Per Gross Ton	Per Gross Ton
F.o.b. Jackson County, Ohio, Furnace		
10%	\$22.00	13% \$24.50
11%	22.50	14% 26.50
12%	23.50	15% 28.50

Silvery Iron

	F.o.b. Jackson County, Ohio, Furnace
	Per Gross Ton
6%	\$19.00
7%	19.50
8%	20.00
9%	20.50
10%	21.00
11%	21.50
12%	22.50
13%	23.50
14%	25.50
15%	27.50

Other Ferroalloys

Ferrotungsten, per lb. wo. del., carloads	\$1.68
Ferrotungsten, less carloads	\$1.15 to 1.25
Ferrocromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	10.00c.
Ferrocromium, 2% carbon	17.00c. to 17.50c.
Ferrocromium, 1% carbon	19.00c. to 20.00c.
Ferrocromium, 0.10% carbon	23.50c. to 25.00c.
Ferrocromium, 0.06% carbon	25.50c. to 27.00c.
Ferrovandium, del., per lb. contained Va.	\$3.05 to \$3.30
Ferrocantitanium, 15 to 18%, per net ton, f.o.b. furnace, in carloads	160.00
Ferrophosphorus, electric or blast furnace material, in carloads, 18% Rockdale, Tenn., base per gross ton	91.00
Ferromolybdenum, per lb. Mo., del.	1.00
Calcium molybdate, per lb. Mo., del.	85c.
Ferrophosphorus, electric, 24%, f.o.b. Anniston, Ala., per gross ton	\$122.50
Silico spiegel, per ton, f.o.b. furnace, car lots	42.50
Ton lots or less, per ton	47.50
Silico-manganese, gross ton, delivered:	
2.50% carbon grade	105.00
1% carbon grade	115.00
Spot prices	\$5 a ton higher

Old Material Quotations

► PITTSBURGH ◀

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	\$10.00 to \$10.50
No. 2 heavy melting steel	9.00 to 9.50
No. 2 railroad wrought	10.00 to 10.50
Scrap rails	10.00 to 10.50
Rails 3 ft. and under	12.00 to 12.50
Sheet bar crops, ordinary	11.00 to 11.50
Compressed sheet steel	9.75 to 10.25
Hand bundled sheet steel	9.00 to 9.50
Hvy. steel axle turnings	9.00 to 9.50
Machine shop turnings	6.75 to 7.25
Short shov. steel turnings	6.75 to 7.25
Short mixed borings and turnings	6.75 to 7.25
Cast iron borings	6.75 to 7.25
Cast iron carwheels	10.50 to 11.00
Heavy breakable cast	8.00 to 8.50
No. 1 cast	9.50 to 10.50
Railr. knuckles and couplers	10.50 to 11.50
Rail. coil and leaf springs	10.50 to 11.50
Rolled steel wheels	10.50 to 11.50
Low phos. billet crops	13.00 to 13.50
Low phos. sheet bar crops	12.50 to 13.00
Low phos. plate scrap	10.00 to 11.50
Low phos. punchings	11.00 to 12.00
Steel car axles	15.00 to 15.50

► CHICAGO ◀

Delivered Chicago district consumers:

Per Gross Ton

Heavy melting steel	\$7.50 to \$8.00
Shoveling steel	7.50 to 8.00
Frogs, switches and guards	7.50 to 8.00
Factory hyd. comp. sheets	5.75 to 6.25
Drop forge flashings	5.00 to 5.50
No. 1 busheling	5.50 to 6.00
Rolled carwheels	8.00 to 9.00
Railroad tires	9.00 to 9.50
Railroad leaf springs	8.50 to 9.00
Axle turnings	5.75 to 6.25
Steel couplers and knuckles	8.25 to 8.75
Coil springs	9.50 to 10.00
Axle turnings (elec. fur.)	6.00 to 6.50
Low phos. punchings	10.00 to 10.50
Low phos. plates, 12 in. and under	9.00 to 9.50
Cast iron borings	3.50 to 4.00
Short shoveling turnings	4.00 to 4.50
Machine shop turnings	4.00 to 4.50
Rerolling rails	10.50 to 11.00
Steel rails, less than 3 ft.	9.25 to 9.75
Steel rails, less than 2 ft.	10.00 to 10.50
Angle bars, steel	8.25 to 8.75
Cast iron carwheels	8.50 to 9.00
Railroad malleable	7.00 to 7.50
Agricultural malleable	7.00 to 7.50
*Relaying rails, 56 to 60 lb.	19.00 to 21.00
*Relay. rails, 65 lb. and up	22.00 to 27.00

Per Net Ton

Iron angle and splice bars	7.00 to 7.50
Iron arch bars, transoms	7.50 to 8.00
Iron car axles	13.50 to 14.50
Steel car axles	10.50 to 11.00
No. 1 railroad wrought	6.50 to 7.00
No. 2 railroad wrought	6.50 to 7.00
No. 1 busheling	5.00 to 5.50
No. 2 busheling	2.50 to 3.00
Locomotive tires, smooth	8.00 to 9.00
Pipes and flues	3.25 to 3.75
No. 1 machinery cast	8.50 to 9.00
Clean automobile cast	7.50 to 8.00
No. 1 railroad cast	7.00 to 7.50
No. 1 agricultural cast	7.00 to 7.50
Stove plate	6.25 to 6.75
Grate bars	5.50 to 6.00
Brake shoes	5.75 to 6.25

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

► PHILADELPHIA ◀

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	\$7.25 to \$8.25
No. 2 heavy melting steel	6.00 to 6.50
No. 1 railroad wrought	9.50 to 10.00
Bundled sheets	6.00
Hydraulic compressed, new	7.00 to 7.50
Hydraulic compressed, old	6.00 to 6.50
Machine shop turnings	4.50
Heavy axle turnings	7.00 to 8.00
Cast borings (nom.)	3.50
Heavy breakable cast	9.00
Stove plate (steel works)	7.00
No. 1 low phos. hvy.	11.00 to 12.00
Couplers and knuckles	10.00 to 10.50
Rolled steel wheels	9.50 to 10.00
No. 1 blast furnace	3.50
Spec. iron and steel pipe	10.50
Shafting	15.00 to 15.50
Steel axles	15.00 to 15.50
No. 1 forge fire	6.75 to 7.25
Cast iron carwheels	11.50 to 12.00
No. 1 cast	10.00 to 10.50
Cast borings (chem.)	11.50 to 12.00
Steel rails for rolling	10.50

► CLEVELAND ◀

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	\$7.50 to \$8.00
No. 2 heavy melting steel	6.75 to 7.25
Compressed sheet steel	7.00 to 7.25
Light bundled sheet stampings	6.00 to 6.50
Drop forge flashings	6.00 to 6.25
Machine-shop turnings	4.50 to 4.75
Short shoveling turnings	5.75 to 6.25
No. 1 busheling	6.50 to 6.75
Steel axle turnings	7.50 to 8.00
Low phos. billet crops	14.00 to 14.50
Cast iron borings	4.50 to 4.75
Mixed borings and short turnings	4.50 to 4.75
No. 2 busheling	4.50 to 4.75
No. 1 cast	9.00 to 9.50
Railroad grate bars	6.00 to 6.50
Stove plate	6.00 to 6.50
Rails under 3 ft.	15.00 to 15.50
Rails for rolling	13.00 to 13.50
Railroad malleable	11.00 to 11.25

► BUFFALO ◀

Per gross ton, f.o.b. Buffalo consumers' plants:

No. 1 heavy melting steel	\$8.00
No. 2 heavy melting scrap	6.50 to 7.50
Scrap rails	8.00 to 8.50
New hydral. comp. sheets	6.50
Old hydral. comp. sheets	6.50
Drop forge flashings	6.50 to 7.00
No. 1 busheling	6.50 to 7.00
Hvy. steel axle turnings	8.00 to 8.50
Machine shop turnings	4.50 to 5.00
Knuckles and couplers	10.00
Coil and leaf springs	10.00
Rolled steel wheels	10.00
Low phos. billet crops	12.50 to 13.00
Short shov. steel turnings	7.00 to 7.50
Short mixed borings and turnings	6.00 to 6.50
Cast iron borings	6.00 to 6.50
No. 2 busheling	4.50 to 5.00
Steel car axles	10.00 to 11.00
Iron axles	12.00 to 12.50
No. 1 machinery cast	10.00 to 10.50
Stove plate	8.25 to 8.50
Steel rails, 3 ft. and under	12.00 to 12.50
Cast iron carwheels	9.00 to 9.50
Industrial malleable	9.50 to 10.00
Railroad malleable	9.50 to 10.00
Chemical borings	9.00 to 9.50

► BIRMINGHAM ◀

Per gross ton delivered consumers' yards:

Heavy melting steel	\$8.50 to \$9.00
Scrap steel rails	8.50 to 9.00
Short shoveling turnings	3.50 to 4.00
Stove plates	6.00
Steel axles	12.00
Iron axles	12.00
No. 1 railroad wrought	6.00
Rails for rolling	9.00 to 9.50
No. 1 cast	9.00
Tramcar wheels	9.00 to 10.00
Cast iron borings, chem.	10.00 to 11.00

► ST. LOUIS ◀

Dealers' buying prices per gross ton:

Selected heavy steel	\$7.00 to \$7.50
No. 1 heavy melting	6.50 to 7.00
No. 2 heavy melting	6.25 to 6.75
No. 1 locomotive tires	8.00 to 8.50
Misc. stand-sec. rails	8.00 to 8.50
Railroad springs	8.50 to 9.00
Bundled sheets	4.25 to 4.75
No. 2 railroad wrought	6.50 to 7.00
No. 1 busheling	6.00 to 6.50
Cast iron borings and shoveling turnings	4.75 to 5.25
Iron rails	7.00 to 8.00
Rails for rolling	9.50 to 10.00
Machine shop turnings	3.00 to 3.50
Heavy turnings	5.50 to 6.00
Steel car axles	10.00 to 10.50
Iron car axles	14.00 to 14.50
Wrot. iron bars and trans.	5.00 to 5.50
No. 1 railroad wrought	4.75 to 5.25
Steel rails, less than 3 ft.	10.00 to 10.50
Steel angle bars	6.75 to 7.25
Cast iron carwheels	6.50 to 7.00
No. 1 machinery cast	8.00 to 8.50
Railroad malleable	5.00 to 5.50
No. 1 railroad cast	6.25 to 6.75
Stove plate	6.00 to 6.50
Relay. rails, 60 lb. and under	16.00 to 16.50
Relay. rails, 70 lb. and over	20.00 to 21.00
Agricult. malleable	5.00 to 5.50

► NEW YORK ◀

Dealers' buying prices per gross ton:

No. 1 heavy melting steel	\$4.25 to \$5.50
Heavy melting steel (yard)	2.75 to 3.00
No. 1 hvy. breakable cast	5.00 to 5.50
Stove plate (steel works)	3.00 to 3.50
Machine shop turnings	1.75 to 2.00
Short shoveling turnings	1.75 to 2.00
Cast borings	1.25 to 1.50
No. 1 blast furnace	1.25 to 1.50
Steel car axles	10.00 to 10.50
Iron car axles (nom.)	14.00 to 14.50
Spec. iron and steel pipe	5.00
Forge fire	3.25
No. 1 railroad wrought	5.00 to 5.25
No. 1 yard wrought, long	4.00 to 4.25
Rails for rolling	6.00 to 6.25
Stove plate (foundry)	4.75 to 5.25
Malleable cast (railroad)	6.00 to 6.50
Cast borings (chemical)	8.00 to 8.50

Per gross ton, delivered local foundries:

No. 1 machinery cast	\$8.50
No. 1 hvy. cast (cupola size)	6.50
No. 2 cast	5.50

► BOSTON ◀

Dealers' buying prices per gross ton:

No. 1 heavy melting steel	\$3.80 to \$4.60
Scrap T rails	3.80 to 4.60
Machine shop turnings	1.05
Cast iron borings	1.05
Bundled skeleton, long	3.00 to 3.25
Forge flashings	3.00 to 3.50
Blast furnace scrap	1.05
Forge scrap	3.00 to 3.25
Shafting	9.50 to 10.00
Steel car axles	9.00 to 9.50
Wrought pipe	4.00 to 4.25
Rails for rolling	6.00 to 6.50
Cast iron borings, chemical	7.00 to 7.25

Per gross ton delivered consumers' yards:

Textile cast	\$8.75 to \$9.25
No. 1 machinery cast	8.75 to 9.25
Stove plate	5.00 to 5.25
Railroad malleable	10.50 to 11.00

► CINCINNATI ◀

Dealers' buying prices per gross ton:

Heavy melting steel	\$6.00 to \$7.00
Scrap rails for melting	8.00 to 8.50
Loose sheet clippings	2.75 to 3.25
Bundled sheets	4.75 to 5.25
Cast iron borings	2.75 to 3.25
Machine shop turnings	3.25 to 3.75
No. 1 busheling	4.25 to 4.75
No. 2 busheling	2.50 to 3.00
Rails for rolling	9.00 to 9.50
No. 1 locomotive tires	8.50 to 9.00
Short rails	11.75 to 12.25
Cast iron carwheels	8.25 to 8.75
No. 1 machinery cast	10.00 to 10.50
No. 1 railroad cast	8.75 to 9.25
Burnt cast	4.25 to 4.75
Stove plate	4.25 to 4.75
Agricultural malleable	8.00 to 8.50
Railroad malleable	9.00 to 9.50

► DETROIT ◀

Dealers' buying prices per gross ton:

Hvy. melting	\$5.75 to \$6.25
Borings and short turnings	3.50 to 4.00
Long turnings	3.25 to 3.75
No. 1 machinery cast	8.50 to 9.00
Automotive cast	10.75 to 11.25
Hydral. comp. sheets	5.75 to 6.25
Stove plate	5.00 to 5.50
New No. 1 busheling	5.00 to 5.50
Old No. 2 busheling	3.25 to 3.75
Sheet clippings	3.50 to 4.00
Flashings	5.00 to 5.50

► CANADA ◀

Dealers' buying prices per gross ton:

Toronto Montreal	
Heavy melting steel	\$7.00 \$6.00
Rails, scrap	7.00 6.00
No. 1 wrought	6.00 8.00
Machine shop turnings	2.00 2.00
Boiler plate	5.00 4.50
Heavy axle turnings	2.50 2.50
Cast borings	2.00 2.00
Steel borings	2.00 2.00
Wrought pipe	2.00 2.00
Steel axles	7.00 9.00
Axles, wrought iron	7.00 11.00
No. 1 machinery cast	12.50 10.00
Stove plate	10.00 8.00
Standard carwheels	11.00 8.50
Malleable	10.00 8.00

▲▲▲ Warehouse Prices for Iron and Steel Products ▲▲▲

► CHICAGO ◀

	Base per Lb.
Plates and structural shapes	3.00c.
Soft steel bars	2.75c.
Reinforcing bars, billet steel, 1.50c. to 1.80c.	
Rail steel reinforcement—	
For buildings	1.30c. to 1.55c.
Road slabs, bridges, culverts	1.40c.
Cold-fin steel bars and shafting—	
Rounds and hexagons	3.10c.
Flats and squares	3.60c.
Bands, 3/4 in. (in Nos. 10 and 12 gages)	2.95c.
Hoops (No. 14 gage and lighter)	3.50c.
Hot-rolled annealed sheets (No. 24)	3.55c.
Galv. sheets (No. 24)	4.10c.
Hot-rolled sheets (No. 10)	3.20c.
Spikes (1/2 in. and larger)	2.45c.
Track bolts	4.20c.
Rivets, structural	4.00c.
Rivets, boiler	4.00c.
Machine bolts	Per Cent Off List
Carriage bolts	73
Coupling and lag screws	73
Hot-pressed nuts, sq. top, or blank	73
Hot-pressed nuts, hex. top, or blank	73
No. 8 black ann'd wire, per 100 lb.	\$3.45
Com. wire nails, base per keg	2.30
Cement c'd nails, base per keg	2.30

► CLEVELAND ◀

	Base per Lb.
Plates and struc. shapes	2.55c.
Soft steel bars	2.75c.
Reinforc. steel bars	1.75c. to 1.95c.
Cold-fin. rounds and hex.	3.10c.
Cold-fin. flats and sq.	3.60c.
Hoops and bands, No. 12 to 3/4 in. inclusive	3.00c.
Hoops and bands, No. 12 and lighter	3.55c.
Cold-finished strip	*3.55c.
Hot-rolled annealed sheets (No. 24)	3.60c.
Galvanized sheets (No. 24)	3.75c.
Hot-rolled sheets (No. 10)	3.00c.
No. 9 ann'd wire, per 100 lb.	\$2.25
No. 9 galv. wire, per 100 lb.	2.70
Com. wire nails, base per keg	2.25

*Net base, including boxing and cutting to length.

► CINCINNATI ◀

	Base per Lb.
Plates and struc. shapes	2.35c.
Bars, soft steel or iron	3.00c.
New billet reinforce bars	3.00c.
Hot steel reinforce bars	3.00c.
Hoops	3.50c.
Bands	3.20c.
Cold-fin. rounds and hex.	3.50c.
Squares	4.00c.
Hot-rolled annealed sheets (No. 24)	3.75c.
Galv. sheets (No. 24)	4.25c.
Hot-rolled sheets (No. 10)	3.30c.
Structural rivets	4.70c.
Small rivets	.60 per cent off list
No. 9 ann'd wire, per 100 lb.	\$3.00
Com. wire nails, base per keg (10 to 49 kegs)	2.65
Larger quantities	2.50
Cement c'd nails, base 100-lb. keg	2.95
Chain, per 100 lb.	10.25
Seamless steel boiler tubes, 2-in.	Net per 100 Ft. \$17.50
4-in.	24.00
Lap-welded steel boiler tubes, 2-in.	16.50
4-in.	24.50

► BUFFALO ◀

	Base per Lb.
Plates and struc. shapes	3.25c.
Soft steel bars	3.00c.
Reinforcing bars	2.65c.
Cold-fin. flats and sq.	3.65c.
Rounds and hex.	3.15c.
Cold-rolled strip steel	3.25c.
Hot-rolled annealed sheets (No. 24)	3.70c.
Galv. sheets (No. 24)	4.10c.
Bands	3.35c.
Hoops	3.90c.
Hot-rolled sheets (No. 10)	3.50c.
Com. wire nails, base per keg	\$2.45
Black wire, base per 100 lb.	3.20

► NEW YORK ◀

	Base per Lb.
Plates and struc. shapes	2.70c. to 3.10c.
Soft steel bars, small shapes	2.70c. to 3.10c.
Iron bars, Swed. charcoal	3.24c.
Iron bars, Swed. charcoal	7.00c. to 7.25c.
Cold-fin. shafting and screw stock:	
Rounds and hexagons	3.40c.
Flats and squares	3.90c.
Cold-roll, strip, soft and quarter hard	4.95c.
Hoops	3.75c.
Bands	3.40c.
Hot-rolled sheets (No. 10)	3.00c. to 3.25c.
Hot-rolled ann'd sheets (No. 24*)	3.60c.
Galvanized sheets (No. 24*)	4.00c.
Long term sheets (No. 24)	5.00c.
Standard tool steel	12.00c.
Wire, black annealed	4.50c.
Wire, galv. annealed	5.15c.
Tire steel, 3/4 x 1/4 in. and larger	3.40c.
Smooth finish, 1 to 2 1/2 x 1/4 in. and larger	3.75c.
Open-hearth spring steel, bases	4.50c. to 7.00c.
*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.	
Machine bolts, cut thread:	Per Cent Off List
1/2 x 6 in. and smaller	.65 to .65 and 10
1 x 30 in. and smaller	.65 to .65 and 10
Carriage bolts, cut thread:	
1/2 x 6 in. and smaller	.65 to .65 and 10
3/4 x 20 in. and smaller	.65 to .65 and 10
Boiler Tubes:	Per 100 Ft.
Lap welded, 2-in.	\$19.00
Seamless steel, 2-in.	20.25
Charcoal iron, 2-in.	26.25
Charcoal iron, 4-in.	67.00

► ST. LOUIS ◀

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.00c.
Cold-fin. rounds, shafting, screw stock	3.25c.
Hot-rolled annealed sheets (No. 24)	3.80c.
Galv. sheets (No. 24)	4.35c.
Hot-rolled sheets (No. 10)	3.45c.
Black corrug. sheets (No. 24)	3.85c.
Galv. corrug. sheets	4.40c.
Structural rivets	4.00c.
Boiler rivets	4.00c.
Per Cent Off List	
Tank rivets, 3/4 in. and smaller, 100 lb. or more	.65
Less than 100 lb.	.60
Machine bolts	73
Carriage bolts	73
Lag screws	73
Hot-pressed nuts, sq. blank or tapped, 200 lb. or more	.65
Less than 200 lb.	.63
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more	.73
Less than 200 lb.	.63

► PACIFIC COAST ◀

	Base per Lb.
San Fran. Los An.	
Plates and struc. shapes, 1/4-in. and heavier	2.80c. 3.00c. 2.50c.
Soft steel bars	2.80c. 3.00c. 2.50c.
Reinforcing bars	2.80c. 2.80c. 3.00c.
Hot-rolled annealed sheets (No. 24)	3.90c. 4.00c. 4.00c.
Hot-rolled sheets (No. 10)	3.40c. 3.50c. 3.50c.
Galv. sheets (No. 24)	4.40c. 4.20c. 4.50c.
Struc. rivets, 1/2 in. and larger, less than 1000 lb.	5.00c. 5.00c. 5.50c.
Special nails: common 4 to 60d; smooth box 4 to 20d; finish 6 and 8d; base per keg	\$2.55 \$2.45 \$2.40
Other wire nails, base per keg	2.80 2.70 2.65
Cement c'd nails, 100-lb. keg	2.65 2.70 2.65
San Francisco and Los Angeles schedule subject to allowance of 10c. per 100 lb. for 5000 lb. or over.	
Seattle schedule subject to allowance of 25c. per 100 lb. for 500 lb. or over.	

► PITTSBURGH ◀

	*Base per Lb.
Plates	2.85c.
Structural shapes	2.85c.
Soft steel bars and small shapes	2.60c.
Reinforcing steel bars	2.60c.
Cold-finished and screw stock—	
Rounds and hexagons	3.10c.
Squares and flats	3.60c.
Bands	2.95c.
Hoops	3.60c.
Hot-rolled annealed sheets (No. 24), 25 or more bundles	3.05c.
Galv. sheets (No. 24), 25 or more bundles	3.65c.
Hot-rolled sheets (No. 10)	3.15c. to 3.20c.
Galv. corrug. sheets (No. 28), per square (less than 3750 lb.)	3.74c.
Spikes, large	2.50c.
Small	2.75c. to 2.90c.
Boat	3.00c.
Track bolts, all sizes, per 100 count, 70 and 10 per cent off list	
Machine bolts, 100 count, 70 and 10 per cent off list	
Carriage bolts, 100 count, 70 and 10 per cent off list	
Nuts, all styles, 100 count, 73 and 10 per cent off list	
Large rivets, base per 100 lb.	\$3.00
Wire, black, soft ann'd, base per 100 lb.	2.30
Wire, galv. soft, base per 100 lb.	2.75
Common wire nails, per keg	2.25
Cement coated nails, per keg	2.25

*On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applied to orders of 400 to 999 lb.

► PHILADELPHIA ◀

	Base per Lb.
Plates, 1/4-in. and heavier	2.50c.
Structural shapes	2.50c.
Soft steel bars, small shapes, iron bars (except bands)	2.60c.
Reinforc. steel bars, sq., twisted and deform.	2.30c.
Cold-fin. steel, rounds and hex.	3.40c.
Cold-fin. steel, sq. and flats	3.90c.
Steel hoops	3.15c.
Steel bands, No. 12 to 3/4-in., inclu.	2.90c.
Spring steel	5.00c.
Hot-rolled box annealed sheets (No. 24)	3.55c.
Galvanized sheets (No. 24)	4.00c.
Hot-rolled blue annealed sheets (No. 10)	3.65c.
Diam. pat. floor plates, 1/4 in.	5.10c.
Swedish iron bars	6.60c.

These prices are subject to quantity differentials except on reinforcing and Swedish iron bars.

► BOSTON ◀

	Base per Lb.
Plates	*3.35c.
Structural shapes	*3.35c.
Soft steel bars, small shapes	*3.25c.
Reinforcing bars	3.10c. to 3.25c.
Iron bars—	
Refined	3.25c.
Best refined	4.60c.
Spring steel, open-hearth	5.00c.
Tire steel	4.50c. to 4.75c.
Bands	*3.75c. to 4.25c.
Hoop steel	4.90c. to 5.40c.
Cold-rolled steel—	
Rounds and hex.	3.50c. to 5.50c.
Squares and flats	4.00c. to 6.00c.
Rivets, structural or boiler	4.80c.
Per Cent Off List	
Machine bolts	70
Carriage bolts	70
Lag screws	70
Hot-pressed nuts	40 and 10
Cold-punched nuts	40 and 10
Stove bolts	70 and 10

*Base price (250 to 999 lb.): less than 250 lb., add 50c. per 100 lb.; 1000 to 7999 lb., deduct 15c.; 8000 to 14,999 lb., deduct 25c.; 15,000 lb. and larger lots, deduct 35c.

Fabricated Structural Steel

Awards of 14,000 Tons Include 3300-Ton Bank in New York— New Projects Total 22,500 Tons

NEW fabricated structural steel projects registered a slight increase this week, despite the approaching year-end. The total is 22,500 tons of new work, compared with 17,500 tons a week ago. Included are 7300 tons for an apartment hotel on Michigan Avenue, Chicago, and 5000 tons for a Federal office building in San Francisco.

Awards also show a slight increase with about 14,000 tons reported this week, compared with only 9500 tons a week ago and 12,500 tons two weeks ago. Included are 3300 tons for the First National Bank Building in New York, and 1200 tons for bridges in Illinois. Awards follow:

NORTH ATLANTIC STATES

Portland, Me., 550 tons, post office, to McIntire-Marshall Corpn.
Proctor, Vt., 250 tons, marble cutting shop to Lackawanna Steel Construction Corpn.
Carmel, Me., 140 tons, bridge, to an unnamed fabricator.
Providence, R. I., 375 tons, theater, to an unnamed fabricator.
New York, 3300 tons, First National Bank building, to American Bridge Co.
New York, 530 tons, Bowery Savings Bank building addition, to an unnamed fabricator.
Brooklyn, 775 tons, pier shed, to an unnamed fabricator.
New York, 125 tons, garage at 28 Rose Street, to Easton Structural Steel Co.; Wallenstein Construction Corpn., New York, general contractor.
New York, 600 tons, substructure for apartment building at Riverside Drive and 155th Street, to Easton Structural Steel Co.
Creedmoor, N. Y., 300 tons, State Hospital buildings, to Easton Structural Steel Co.
Norristown, Pa., 140 tons, employees' building at Norristown State Hospital, to Bethlehem Fabricators, Inc.
Allentown, Pa., 250 tons, repairs to Hamilton Street bridge, to Bethlehem Fabricators, Inc.
Lakeland, N. J., 375 tons, addition to hospital building, to Bethlehem Fabricators, Inc.
Pennsylvania Railroad, 675 tons, signal supporting beams, to McIntire-Marshall Corpn.
Trenton, N. J., 325 tons, transit shed for city, to N. A. K. Bugbee, erector, Trenton.
Pittsburgh & West Virginia Railroad, 380 tons, bridge in Allegheny County, Pa., to McIntire-Marshall Corpn.
Bedford Hills, N. Y., 290 tons, State reformatory for women, to B. Schacht & Sons.

CENTRAL STATES

St. Paul, Minn., 200 tons, office building, to St. Paul Structural Steel Co.
Williamson County, Ill., 250 tons, bridge, to Vincennes Bridge Co.
Chicago, 250 tons, Thorne Auditorium for Northwestern University, to an unnamed fabricator.
State of Iowa, 200 tons, bridges, to Pittsburgh-Des Moines Steel Co.
State of Illinois, 1200 tons, bridges, to Clinton Bridge Co.
State of Michigan, 415 tons, highway bridge work, 255 tons, to Fort Pitt Bridge Works Co., 150 tons, to McIntire-Marshall Corpn.
Greedy County, Mo., 220 tons, two bridges, to an unnamed fabricator.

THE SOUTH

Harvey, La., 800 tons, lock and gate for dam, to Hardie-Tyne Mfr. Co., Birmingham.
New Orleans, 720 tons, Poland Street wharf for New Orleans Dock Board, to American Bridge Co.

WESTERN STATES

Boise County, Idaho, 150 tons, Payette National Forest bridge, to Minneapolis Steel & Machinery Co.
Long Beach, Cal., 250 tons, grade crossing, to Consolidated Steel Co.
Los Angeles, 100 tons, office building for Pacific Coast Steel Co., to McIntire-Marshall Corpn.

HAWAII

Kauai, 120 tons, bridge, to American Bridge Co.

CANAL ZONE

Panama, 2500 tons, steel sheet piling for Culebra Construction Co., general contractor for Madden Dam, to Bethlehem Steel Export Corpn.

NORTH ATLANTIC STATES

Cambridge, Mass., 600 tons, Ringe school.
Melrose, Mass., 500 tons, high school.
Elmira, N. Y., 140 tons, State reformatory building; bids opened Dec. 29.
New York, 300 tons, garage at 352 West Eighty-seventh Street.
New York, 350 tons, addition to school No. 19, Queens.
New York, 350 tons, addition to school No. 161, Queens.
Buffalo, 500 tons, building for Sears, Roebuck & Co.
Trenton, N. J., 1000 tons, rebuilding highway bridge.
Pittsburgh, 12,000 tons, post office; Aronberg, Fried Co., New York, low bidder on general contract.

Reinforcing Bars

Awards 3900 Tons—New Projects 2900 Tons

AWARDS

Bedford Hills, N. Y., 300 tons, women's State reformatory building, to Igoo Brothers.
New York, 520 tons, Piers 88, 90 and 92, Hudson River, for Department of Docks, to Empire Steel Products Co., New York; Allen N. Spooner & Son, Inc., New York, general contractor.
Brooklyn, 380 tons, Kings County Hospital nurses' and married employees' building, to Igoo Brothers.
Creedmoor, N. Y., 170 tons, State Hospital buildings, to Rawlins Steel Co.; Agostini Brothers, New York, general contractors.
Philadelphia, 280 tons, school at Thirtieth and Tasker Streets, to Kalman Steel Co.
Fort Jay, N. Y., 350 tons, non-commissioned officers' quarters, to Capitol Steel Construction Co. of New York; previously reported to Igoo Brothers.
Chicago, 180 tons, power house for Union Station, to Calumet Steel Co.
Los Angeles, 500 tons, overland terminal warehouse, to Pacific Coast Steel Co.
Sunnyvale, Cal., 300 tons, dirigible dock structures, to Soile Steel Co.
Tehachapi, Cal., 160 tons, State women's institution, to Steel Erection Co.
Santa Barbara County, Cal., 320 tons, State highway structures, to Pacific Coast Steel Co.
San Luis Obispo County, Cal., 113 tons, highway bridges, to Pacific Coast Steel Co.
Sacramento, 700 tons, filtration plant, to Northwestern Steel Rolling Mills.

NEW REINFORCING BAR PROJECTS

Elmira, N. Y., unstated tonnage, State reformatory buildings; bids open Dec. 28.
New York, 585 tons, First National Bank building, 2 Wall Street, Mare Edlitz & Son, Inc., New York, general contractor.
Rochester, N. Y., 125 tons, Monroe County Home.

CENTRAL STATES

State of Indiana, 750 tons, highway bridges.
State of Illinois, 600 tons, highway bridges.
Chicago & North Western Railroad, 450 tons, two bridges.
Rock Island, Ill., 1675 tons, lock and dam on Mississippi River; Stephen A. Healy, Detroit, low bidder on general contract.
Justice Park, Ill., 4100 tons, viaduct on Mannheim Road; Minder Construction Co., low bidder on general contract.
Chicago, tonnage not estimated, Lieberman apartment hotel.
Chicago, 7300 tons, apartment hotel on Michigan Avenue.
Milwaukee, 500 tons, County Nurses' Home; Warden Allen Co., low bidder.
Butler, Wis., 440 tons, State highway bridge.
Topeka, Kan., 1500 tons, post office.

THE SOUTH

State of Georgia, 400 tons, two highway bridges.
State of West Virginia, 550 tons, two highway bridges.
State of Texas, 500 tons, Brazos River bridge in Young County, request for bids canceled.

WESTERN STATES

Seattle, 300 tons, Black Diamond highway bridge.
San Francisco, 5000 tons, Federal office building; bids expected to be out in January.
Hoover Dam, 1150 tons, shapes for tunnel lining.

FABRICATED PLATE

NEW PROJECTS

Signal Hill, Cal., 850 tons, 18 and 20 in. pipe (alternate).
Hoover Dam, 225 tons, tunnel lining.
Alameda, Cal., 150 tons, tank for Benton Army Air Field.

Attica, N. Y., 100 tons, State prison building; John Johnson Co., Buffalo, general contractor.

Washington, 300 tons, St. Elizabeth's hospital; O'Neill Construction Co., Chicago, general contractor.

Rock Island, Ill., 5000 tons, United States lock and dam No. 15; Stephen A. Healy, Detroit, low bidder on general contract.

Manteno, Ill., 800 tons, State institutional buildings.

Hinsdale, Ill., 125 tons, spinsters home, Onimette Construction Co., general contractor.

Long Beach, Cal., 600 tons, post office.

Sacramento, 500 tons, addition for post office.

Martinez, Cal., 350 tons, additional tonnage for court house.

Los Angeles, 150 tons, Venice Boulevard bridge.

Prosser, Wash., 105 tons, Yakima Federal reclamation project canal.

Pipe Lines

Great Lakes Pipe Line Co., Ponca City, Okla., plans additions to gasoline pipe line system now extending from Oklahoma to Chicago and Minneapolis.

Missouri Power & Light Co., Kansas City, Mo., plans pipe line for natural gas distribution at Vandalia, Mo., where franchise has been granted.

Board of County Supervisors, Fresno, Cal., rejected bids recently received for installation of pipe line for water service at county institution at Auberry, Cal., and will ask new bids soon.

Continental Construction Co., an interest of Cities Service Co., 60 Wall Street, New York, has changed its name to Natural Gas Pipeline Co., and increased its capital from 500,000 to 1,500,000 shares of stock, no par value. Extensions are contemplated in pipe lines in Texas Panhandle district through Oklahoma, Kansas and other states to points in East.

Machining of Steel Is Conditioned by Quality of Metal

(Concluded from page 1609)

performance, the results obtained should lead to reliable conclusions. It is obviously impossible to have minimum softness and ductility at the same time.

Relative Importance of Softness and Ductility

The question of which is the more important factor immediately presents itself. The author's conclusions, obtained from tests run under conditions approximating those enumerated above, are that for rough lathe work, where surface is not a major consideration, low hardness is more important than low ductility. But it has been demonstrated that in such fine work as cutting transmission gears of chrome-vanadium steel, better production, better tool life and better finish are obtained when the steel has a Brinell hardness of 228

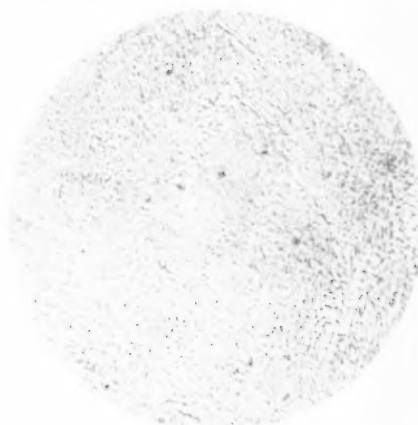


FIG. 4.—Lamellar pearlitic structure of a steel with a Brinell of 228.

than when that hardness is 202, provided both structures are lamellar pearlite. Fig. 4 shows the fine lamellar pearlitic structure of such a steel having a Brinell hardness of 228, and it will be seen from the properties listed below, that the increased hardness is accompanied by a distinct loss of ductility:

Yield Point	Ultimate Stress	Elong. in 2 In.	Red. of Area	Brinell
58,270	115,350	17.2	31.6	228

Annealing a Most Important Factor

Chrome steel and chrome-vanadium steel of about 0.50 per cent carbon are so much used for transmission gears that something may be said about machining them. It scarcely will be disputed that the annealing of the gear blanks is the single most important factor. An annealed product, with a uniform fine lamellar pearlite, means smooth rapid operations on the machine lines, with excellent tool life. But a product with an appreciable amount of sorbite is sure to cause trouble, low production, burnt cutters, poor tool life.

A certain amount of mystery shrouds the annealing of these gear blanks and yet it is not really mysterious. With these chrome steels, it is necessary to heat pretty well over the upper critical point to avoid spheroidizing. After that, all that is necessary is to cool fairly slowly through the critical in order to produce a lamellar pearlite. The slower the cooling, the coarser the lamellæ of the pearlite; the faster the

cooling, the finer the lamellæ, until such a speed of cooling is reached that sorbite is produced.

Some Heat-Treating Details

This last condition must be avoided by all means, but it has been demonstrated that fine lamellar pearlite has better machining qualities than coarse lamellar in transmission gears. It is customary, after heating to the high temperature in annealing, to cool the blanks in an air draft to the A_r , at about 1320 deg. F. This rapid cool has no effect whatever upon the structure, but is intended simply to save time.

However, this fast cool down to the A_r is the most delicate part of the operation, as there is always the danger of going too far before checking the cooling. It is quite possible to cool the blanks down to 1280 deg. F., say, before they go on into that section of the furnace where they are supposed to be cooled slowly through the critical. Of course the fast cool has suppressed the critical so that, when the cooling is checked, the steel is completely austenitic. But then it might be said that the critical comes back up through the steel, rather than that the steel cools through the critical.

In any case, the result of cooling rapidly to a point below the A_r is that a percentage of sorbite is formed. The correct procedure is to cool the steel rapidly from the high temperature to a point slightly above the A_r , to allow it to coast gradually down to the A_r , and to control the speed of cooling through that critical to a degree which will give a product having a Brinell hardness as close to 228 as possible.

Methods Used in Charging Industrial Storage Batteries

(Concluded from page 1613)

the vehicle in the negative battery circuit) in which there is contained a set of "break" contacts at the "full charge" or zero position. These contacts are connected to the panel through an additional lead in the charging cable. This requires that the charging plug and receptacle be provided with an auxiliary contact.

When the truck or locomotive is not supplied with ampere-hour meter this instrument can be mounted on the control panel in the negative battery circuit. Under these conditions the ampere-hour meter does not indicate the ampere-hours out of the battery and before starting a charge it is necessary for the operator to set the ampere-hour meter to correspond to the ampere-hours out as determined by specific gravity readings or otherwise.

The number of cells in all batteries charged from one charging equipment is usually the same. However, it is possible to charge batteries of a smaller number of cells from the same bus as for the larger number of cells. This is accomplished by starting the charge at a high voltage per cell and high charging current and at a predetermined point in the charge automatically cut in additional resistance to reduce the current to the finishing rate. This is termed "two-rate charging."

European Business Affected by Holidays; Welsh Tin Plate Mills Well Engaged

(By Cable)

LONDON, ENGLAND, Dec. 21.

BUSINESS is influenced by the usual holiday quiet and mills are suspending operation for periods up to 10 days, depending upon the accumulation of orders on their books.

General export business is quiet and but little improvement is expected. There is moderate Far Eastern and domestic demand for Continental steel, but mills are still greatly in need of orders.

Belgian steel mills are still discussing closing plants, and steel men have approached the Government asking that it assist in modifying the effects of high-tariff legislation and "economic nationalism" developing so rapidly in foreign countries.

Welsh tin plate business is improving and inquiry is increasing, especially from the Continent, Far East and North America. Orders are being placed at prices up to 14s. 9d. (\$2.46) per base box, f.o.b. works port, although most mills are accepting business at 14s. 3d. to 14s. 6d. (\$2.38 to \$2.42) base, for first quarter delivery.

Tin plate mills are generally well engaged with business and the usual holiday stoppage is likely to be short in this branch of the steel industry. At the annual meeting of Richard Thomas & Co. and W. J. Firth, it was stated that a great improvement in the quality of tin plate enabled them to secure preference and premiums in all foreign markets.

In Germany, the tin plate mills are operating on part time and it has been necessary to dismiss large numbers.

The Prager Eisenindustrie in Czechoslovakia is blowing out its Kladno furnace, leaving eight of a total of 27 furnaces in blast in Czechoslovakia.

The Italian Rolled Steel Cartel has been renewed provisionally for six months, or until June. The Mysore Iron Works in India is planning to erect a steel mill.

Soviet output in November was 450,000 tons of pig iron, 467,000 tons of open-hearth steel and 356,000 tons of rolled steel products.

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German Aircraft Motor Unusually Light

HAMBURG, GERMANY, Dec. 12.—New aluminum alloys are being developed by Continental manufacturers, and recently all important parts of Maybach motors used in dirigibles have been of aluminum. The Maybach company has furnished motors for the 128 Zeppelins which have been built in Germany, and the new American dirigible Akron contains these motors. A new series developed by the Maybach company for dirigible use is of 12 cylinders, 160 hp. and weighs only 1,115 lb. per hp.

Newly developed aluminum alloys in Germany and other Continental countries show extensive use of titanium, and certain of the new alloys contain antimony, nickel or magnesium silicide in addition to other alloying agents.

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German Steel Export Business Irregular

HAMBURG, GERMANY, Dec. 12.—German exporters of steel find that business with Great Britain has almost ceased since the end of November. In Norway and Sweden, buy-

ing has been greatly restricted because of the financial situation, and business with the Baltic countries is curtailed by Government restrictions on buying abroad.

Holland is about the only Continental market which is still active, as buyers there are expecting imposition of additional duties. Inquiry from Asiatic markets continues good, but actual buying is limited to China. In Africa, only Egypt and South Africa are moderately active export buyers. South American markets, except for Argentina, which has placed some substantial steel tonnage in Europe, are quiet. Orders from Canada, and Gulf and Pacific coasts of the United States are small and irregular.

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Continent Exporting More Wire Netting

HAMBURG, GERMANY, Dec. 12.—Effective Jan. 1, the Continental Wire Cartel will control wire netting exports to European markets, and after Feb. 2, the cartel will handle export business to overseas markets. As wire netting makers in Austria and Czechoslovakia have not become members, their competition with the cartel is expected to prevent extreme price advances. Demand for wire netting has been active recently, buyers foreseeing its inclusion among the products controlled by the wire cartel. German wire netting makers have about doubled the export business on their books a year ago, with orders from China, Argentina, South Africa, India, Straits Settlements and some business from Canada and the United States.

British and Continental European Export Prices f.o.b. United Kingdom and Continental Ports

British Prices, f.o.b. United Kingdom Ports

Per Gross Ton, £ at \$3.35		\$20.15	
Ferromanganese, export, £9 9s.			
Billets, open-hearth....	5 7½ to 15 12½s.	18.00 to \$18.84	
Black sheets, Japanese specifications.....	9 7½ to 9 10	31.40 to 31.82	
Tin plate, per base box... 0 14	to 0 14½	2.34 to 2.46	
		Cents a Lb.	
Steel bars, open-hearth..	7 17½ to 8 7½	1.18 to 1.25	
Beams, open-hearth....	7 7½ to 7 17½	1.10 to 1.18	
Channels, open-hearth..	7 12½ to 8 2½	1.14 to 1.22	
Angles, open-hearth....	7 7½ to 7 17½	1.10 to 1.18	
Black sheets, No. 24 gage	8 9 to 8 10	1.20 to 1.27	
Galvanized sheets, No. 24 gage.....	9 5	1.38	

Continental Prices, f.o.b. Continental Ports

Per Metric Ton, Gold £ at \$4.86		\$11.42 to \$11.51	
Billets, Thomas.....	£2 7s. 10		
Wire rods, No. 5 B.W.G.	5 5	25.51	
Black sheets, No. 31 gage, Japanese.....	11 5	54.68	
		Cents a Lb.	
Steel bars, merchant....	2 14	0.59	
Beams, Thomas.....	2 14	0.59	
Angles, Thomas, 4-in. and larger.....	2 13	10 2 14	0.58 to 0.59
Hoops and strip steel over 6-in. base.....	3 10	to 3 12½	0.79 to 0.81
Wire, plain, No. 8.....	5 7½		1.18
Wire, barbed, 4-pt., No. 10, B.W.G.....	8 15		1.93

PLANT EXPANSION AND EQUIPMENT BUYING

Machine Tool Industry Looks for Improvement

Many Inquiries Pending, But Orders Await Trend of General Business in the New Year

THE machine tool industry is about to write off one of its most discouraging years. As the new year approaches, however, there is a renewed spirit of hopefulness, which is founded in part on the fairly large number of inquiries for equipment received in the past month or two. No action on these inquiries is expected until the new year, and then only if general business shows signs of a turn for the better. The machine tool industry does not pin its hopes on enlargement of present

manufacturing facilities, since productive capacity in many lines seems to be ahead of probable requirements for some months, but on the trend toward lower cost production, which in many instances will make necessary the modernization of shop equipment.

If only a fraction of the outstanding inquiries were to result in orders early in the new year, the machine tool trade would be more active than in a long time. In addition to these scattered inquiries, there are prospects of further buying by automobile

companies for production of new models. The Studebaker Corp., will, it is reported, buy more equipment for the manufacture of the new Rockne car.

A good many machine tool builders will present new equipment in 1932. In some instances the offerings are the result of development work that has long been in progress, and the new machines have been held off the market until the business outlook seemed propitious for their introduction.



New York

Sales of machine tools are generally for single installations of small lathes, milling machines and other equipment. Inquiry, however, continues to improve, with a growing number of companies appearing as prospective buyers of one and two tools early next year. While some of this accumulating volume of inquiry apparently represents actual intention to buy, in certain instances inquiries are primarily to aid in making appropriations for 1932, and equipment will probably not be purchased until there is definite improvement in business.

Pittsburgh

While some dealers in this district have had slightly heavier orders this month than in November, the trade has little definite assurance of increased buying after the turn of the year. Some new inquiry has been appearing, but most of it is for estimating purposes. In many cases recommendations for new tools have been made by shop executives, but the necessary appropriations have not been forthcoming.

The Westinghouse Electric & Mfg. Co., East Pittsburgh, is still said to be considering the issuance of a list, but gives no promise of immediate purchases. No interest in new tools is reported by the railroads and structural steel fabricators in this district are doing no buying.

Milwaukee

While the remaining days of this year are not expected to develop much new business, the machine tool trade is busy preparing for an aggressive campaign to begin with the first business day of the new year. Meanwhile, production has declined, with most industrial shops taking an extended vacation over the Christmas holiday. Much encouragement for improvement in general business is found in occasional orders which in more nearly normal times might not attract much attention. Since productive capacity seems to be well ahead of probable requirements for some months, tool builders place much faith in the possibilities of shop equipment modernization.

Cincinnati

Single tool orders for light lathes and cutter grinders were larger the past week, but had small effect on the market generally. Manufacturers have a large number of quotations out on which even a fractional return would brighten the market noticeably. Plants are being operated at a steady rate, although there are reports of shutting down over the holiday period.

Chicago

Dealers' interest is once again turning to automobile plants, as reports of contemplated changes are spread. Studebaker Corp., South Bend, Ind.,

is a prospective purchaser of additional equipment for the Rockne car, and it is reported that Nash Motors Co., Kenosha, Wis., is preparing new models for presentation early in the spring and that this company also may build a low-priced car. A Cleveland company is looking for a used 60-in. press of 250 tons capacity.

New England

Machine tool dealers report a large list of prospects from which considerable business is expected after Jan. 15, or when inventories are out of the way. The Bullard Co., Bridgeport, Conn., and some other New England tool builders will present an improved line of equipment after Jan. 1.

Cleveland

Quite a little inquiry, mostly for single machines, continues to come out, but few tools were bought during the week and the market is expected to be exceedingly quiet the remainder of the month. Inquiries that have been issued in the past two or three months, and which are still pending, aggregate a large amount of equipment. How much of this will be purchased in January will depend largely on the industrial situation then. A great deal of machinery has become obsolete during the depression, and plant managers realize that replacements will be necessary when normal operations are restored.

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Sheet Metal Excellence

FOR many years AMERICAN Steel Sheets have successfully fulfilled the requirements of users in every field of human endeavor. The established reputation of these products for *reliability and excellence* is indicative of a *service* well performed. These sheets are of highest quality, correctly manufactured in every detail—both mechanically and metallurgically.



AMERICAN Products are supplied in Black and Galvanized Sheets, Cold Rolled Sheets, Automobile Sheets, Electrical Sheets, Keystone Rust Resisting Copper Steel Sheets, Heavily Coated Galvanized

Sheets, Galvannealed Sheets, Formed Roofing and Siding Products, Special Sheets, Tin and Terne Plates for all known purposes, and U S S Stainless and Heat Resisting Steel Sheets and Light Plates.

American Sheet and Tin Plate Company

GENERAL OFFICES: Frick Building, PITTSBURGH, PA.

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AMERICAN STEEL AND WIRE COMPANY
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COLUMBIA STEEL COMPANY
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MANUFACTURING COMPANIES:
FEDERAL SHIPB'LDG. & REPAIR CO.
MINNESOTA STEEL COMPANY
NATIONAL TUBE COMPANY

OIL WELL SUPPLY COMPANY
THE LORAIN STEEL COMPANY
TENNESSEE COAL, IRON & RAILROAD CO.
UNIVERSAL ATLAS CEMENT COMPANY

Pacific Coast Distributors—Columbia Steel Company, Russ Bldg., San Francisco, Calif.

Export Distributors—United States Steel Products Company, 30 Church St., New York, N. Y.

◀ NEW YORK ▶

American Smelting & Refining Co., 120 Broadway, New York, acquired Big Blue gold mines, Kernville, Kern County, Cal., and plans development, including buildings, machinery, etc. Cost close to \$1,000,000 with equipment. H. R. Abbot, Salt Lake City, Utah, company engineer, is in charge.

Todd, Robertson & Todd Engineering Corp., Graybar Building, New York, engineer for "Radio City" development, has plans for steam-electric power plant for project, for emergency service for ten building units. Cost over \$150,000 with equipment.

Board of Education, 500 Park Avenue, New York, plans manual training department in new multi-story high school at Baynton Avenue and East 172nd Street, Bronx. Site selected. Cost over \$2,000,000. W. C. Martin, Flatbush Avenue extension and Concord Street, Brooklyn, architect for board.

American Paper Machinery & Engineering Works, Inc., Glens Falls, N. Y., has been organized by Harold D. Wells, Glens Falls, and Herman G. Robde, Queensbury, N. Y., to take over and expand company of same name, manufacturer of paper and pulp machinery, parts, etc.

John Lucas & Co., 521 Washington Street, New York, manufacturers of paints, varnishes, etc., plan rebuilding six-story storage and distributing plant recently destroyed by fire. Loss over \$125,000 with equipment.

Delaware, Lackawanna & Western Railroad Co., 90 West Street, New York, asks bid until Dec. 30 for quantity of wrought steel pipe up to 1000 tons, and 10,000 to 20,000 locomotive boiler tubes (Serial Contract 2041); for quantity of axles for freight cars, and axles for passenger coaches, locomotives, tenders, engine trucks, etc. (Serial Contract 2041).

Standard Gas & Electric Co., 111 Broadway, New York, operating electric and gas utilities, has authorized fund of \$25,015,296 for operation, expansion and improvements in 1932; \$18,347,300 for electric division, \$5,319,800 for gas department, and \$5,358,557 for other departments, including general construction.

Weil Brothers, 507 West 125th Street, New York, plumbing equipment and supplies, leased one-story building, 75 x 100 ft., to be erected at 1310 Amsterdam Avenue, for pipe and equipment storage and distributing plant. Cost about \$10,000 with equipment. Jardine, Mardock & Wright, 347 Madison Avenue, architects.

Department of Sanitation, Municipal Building, New York, has secured appropriation of \$1,000,000 for four garbage and refuse incinerator plants, one each in Manhattan and Queens Boroughs and two in Bronx, three to cost \$1,000,000 each and one, \$1,000,000 with unloading, conveying and other equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 5 for two motor-driven hacksaw machines (Schedule 7123), and one motor-driven single surface planer (Schedule 7096), for Brooklyn Navy Yard.

E. P. Keating Co., 152 Water Street, New York, iron pipe, fittings, etc., operating E. P. Keating Pipe Bending & Supply Co., same address, has acquired plant of Brockway Motor Truck Corp., White Plains, N. Y., for steam and plumbing equipment and supplies.

Fenton Engineering Co., Long Island City, N. Y., has been organized by George F. Fenton, 48-14 Forty-first Street, and associates to manufacture boilers, furnaces and kindred products.

George Swan & Co., 500 Kingsland Road, Nutley, N. J., manufacturers of water heaters and parts, copper tubing, etc., filed plans for one-story unit, 80 x 300 ft. Cost about \$30,000 with equipment.

Benjamin E. Jarvis, Inc., 115 Mechanic Street, Newark, N. J., manufacturer of bench hand saws, metal patterns, etc., leased one-story building, 75 x 100 ft., to be built at 74-78 Malvern Street early next year, for new plant, removing present works.

Little Falls Laundry Co., Little Falls, N. J., will soon begin superstructure for automobile service, repair and garage building to accommodate 400 cars. Cost close to \$100,000 with equipment. Fred W. Wentworth, 110 Market Street, Paterson, N. J., architect.

Essex County Board of Vocational Education, Hall of Records, Newark, Robert O. Beebe, director, is arranging fund of \$635,400 for 1932 program, including purchase of equipment, materials and supplies for various schools.

Newark Wire Die Corp., Newark, has been organized by Wilbur Spiro and asso-

ciates, to take over and expand Newark Wire Die Co., 872 Broadway, manufacturer of mechanical specialties.

Board of Transportation, 250 Hudson Street, New York, John H. Delaney, chairman, has secured fund of \$20,200,000 for 26-mile subway system from Hawtree Street line to Hammels Station.

◀ PHILADELPHIA ▶

Howe & Lescage, 414 South Nineteenth Street, Philadelphia, architects, let general contract to George A. Fuller Co., Morris Building, for three-story and basement automobile service, repair and garage building, 148 x 180 ft. Cost about \$250,000 with equipment.

Commissioners of Fairmont Park, City Hall, Philadelphia, Alan Carson, chief engineer, asks bids until Dec. 29 for castings, machinery, iron and steel, hardware and other equipment.

Schecter Brothers Co., Philadelphia, leased three-story building, 24 x 108 ft., at 2454 North Front Street for manufacture of roofing products and kindred specialties.

Freed Heater & Mfg. Co., Collegeville, Pa., has been organized by Isaac Ash, 1636 Walnut Street and Frank Zimman, 601 North Second Street, both Philadelphia, to take over and expand Freed Heater Co., Collegeville, manufacturer of heaters, parts and other iron products.

Department of City Transit, City Hall Annex, Philadelphia, C. E. Myers, director, asks bids until Dec. 29 for electrical equipment for power substations and subway.

Sun Shipbuilding Co., Chester, Pa., will increase production early in January, adding about 1000 men to working force. Contract has been secured for two large steel freight car carrying vessels for Seatrail Lines, Inc., each to cost about \$1,600,000. Purchase of materials and equipment will be made at once.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 5 for one motor-driven hacksaw (Schedule 7101), 12,300 ft. chrome molybdenum steel tubing (Schedule 7106), quantity of bar aluminum, aluminum alloy tubing, etc. (Schedule 7126), for Philadelphia Navy yard.

New Jersey Seating Co., Artisan Street, near Murray Street, Trenton, N. J., manufacturer of school seats and furniture, metal seating products, etc., has been acquired from receivers by Simon S. Feinstein and associates, for \$122,500. New owners will reorganize company and carry out development.

Mercer County Board of Chosen Freeholders, Court House, Trenton, N. J., asks bids until Dec. 30 for shop and storage building at County work house. William W. Slack & Son, 1101 West State Street, Trenton, architects.

Lehigh Water Works, Easton, Pa., asks bids until Dec. 29 for pumping plant. Edgar A. Wightman, Bankers' Trust Building, Philadelphia, architect.

Williamsport Die & Machine Co., Williamsport, Pa., plans rebuilding part of plant recently destroyed by fire. Loss over \$40,000 with equipment.

Eastern Body & Sales Co., 4233 North Park Avenue, Philadelphia, manufacturer of automobile bodies, leased one-story building containing 6000 sq. ft. space for repair works.

◀ BUFFALO ▶

Camden Wire Co., Camden, N. Y., manufacturer of wire rods, plans rebuilding part of plant recently destroyed by fire. Loss close to \$50,000 with equipment.

Canastota Refrigerating Co., Inc., Canastota, N. Y., recently organized by Frank Hill, North Rose, N. Y., and associates, has acquired former plant of General Foods Corp., and will remodel for an electric-operated cold storage and refrigerating plant.

Dietrich Supply Corp., Syracuse, N. Y., has been organized by Edward G. and Sanford E. Dietrich, 2504 James Street, to manufacture mechanical equipment and parts.

Lewville Gas Co., Lewville, N. Y., has secured permission to issue 11,000 shares of stock, part of fund to be used for extensions and improvements in natural gas pipe lines and stations.

Pavilion Natural Gas Co., Pavilion, N. Y., operating New York State Natural Gas Corp., and other properties, is arranging for acquisition of Genesee Valley Gas Co., operating in neighboring district. Pavilion company plans expansion for production and distribution.

Niagara Blower Corp., 673 Ontario Street, Buffalo, manufacturer of mechanical blowers, parts, etc., has increased capital from \$175,000 to \$300,000 for expansion.

◀ NEW ENGLAND ▶

School Board, Westbrook, Conn., James H. Stanners, chairman of building committee, contemplates manual training department in new high school. Bids on general contract until Dec. 29. Cost over \$125,000. Langdon & Palmer, New London, Conn., architects.

Department of Mental Diseases, Commonwealth of Massachusetts, State House, Boston, let general contract for central steam power plant, 66 x 74 ft., at State Colony, Gardner, to Iredell & White Construction Co., Fitchburg, Mass. Cost over \$100,000 with equipment. A. B. Franklin, Inc., 38 Chauncy Street, Boston, engineer.

Campbell Machine Co., 39 Hayward Street, Quincy, Boston, manufacturer of floor-surfacing and finishing machines, leased additional space for expansion.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 5 for one motor-driven screw-cutting engine lathe (Schedule 7121), and one electrically-heated core oven (Schedule 7115), for Charlestown, Mass., Navy Yard, one motor-driven milling machine for Portsmouth, N. H., yard (Schedule 7124).

Board of Trustees, Clark Institute for Deaf and Dumb, Northampton, Mass., has plans for two-story mechanical shops, each about 45 x 80 ft. Cost about \$60,000 with equipment. Fechner & Ihorst, Provident Bank Building, Cincinnati, architects.

Waterbury Clock Co., Waterbury, Conn., is increasing production of electric clocks and mechanisms, with orders for over 150,000 clock units on hand. Tool makers are working overtime and other departments advancing schedules.

J. L. Clemmey Co., Fall River, Mass., welding, will build a new plant to replace one recently destroyed by fire.

Saco-Lowell Shops, Newton, Upper Falls, Mass., will be consolidated with the company's plant at Biddeford, Me. About \$500,000 will be expended in making the change.

◀ SOUTH ATLANTIC ▶

Southern-Rome Division of Rome Co., Inc., 633 West Pratt Street, Baltimore, manufacturer of steel bedsteads, coil and link springs, etc., with main plant at Rome, N. Y., leased 50,000 sq. ft. space in Gassinger Building for factory branch, storage and distributing plant.

Jeslyn Co., Ninth Street and Chesapeake Avenue, Brooklyn, Baltimore, manufacturer of cross arm braces and other electrical specialties, will build two additions to plant, instead of one, previously announced, 180 x 253 ft. and 50 x 180 ft., first noted for storage and distribution and latter for manufacturing. General contract let to George O. Hansen, Baltimore. On completion, company will raze present factory and use site for another one-story unit, 180 x 215 ft., for storage and distributing division. Cost over \$65,000 with equipment.

Norfolk & Western Railway Co., Roanoke, Va., Clyde Coker, purchasing agent, asks bids until Dec. 30 for quantity of steel plates, bars, etc., for requirements from Jan. 1 to March 31.

Western Electric Co., Point Breeze, Baltimore, manufacturer of telephone equipment, wire and cable, etc., contemplates one-story addition for rubber-covered wire production. Headquarters at 195 Broadway, New York.

Anne Arundel County Public School Board, Annapolis, Md., plans manual training department in three-story local high school. Cost about \$300,000. General contract let to J. Henry Miller, Inc., Eutaw and Franklin Streets, Baltimore. Buckler & Fenhagen, 325 North Charles Street, architect, and James Posey, Baltimore Trust Building, mechanical engineer, both Baltimore.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 5 for six motor-driven selective head engine lathes for New York or San Francisco yards (Schedule 7076); one motor-driven power hammer, New York or San Francisco (Schedule 7107); three motors for pump and engine service, New York, and four motor-generator sets, control equipment and spare parts for Portsmouth yard (Schedule 6897); 10 electric motors, Annapolis, Md. yard (Schedule 7145); three motor-driven tread head engine lathes, Hampton Roads, Va., yard (Schedule 7093). Until Jan. 12 for clamps and punches (Schedule 7142), chisels, knives, wood-boring bits, etc. (Schedule 7139), for Eastern and Western yards.

Supervising Architect, Treasury Department, Washington, will draw plans for extensions and improvements in Capitol power plant, in-

WASTE ACID DISPOSAL

(Reprinted from the November issue of "Duriron News")

WASTE sulphuric acid from pickling tanks containing ferrous sulphate in solution may be disposed of in many ways, from the simple method of discharging it from the plant untreated, up to the very elaborate method of treating the liquor with a neutralizing agent and separating the precipitated solids from the mother liquor and allowing the latter, which is usually pure water, to flow into sewers or streams, as the case may be.

Recommended Method

Herewith we give a brief description of the disposal method we have been recommending to our customers.

The waste acid from pickling tanks is collected in a large gathering sump, which is of the usual brick acid-proof cement construction. Alongside the sump there is a pit in which there are two Duriron No. 604 Centrifugal Pumps. These pumps deliver the waste acid to the Acid Disposal Building. Two other sumps are interconnected and to them the acid from the gathering sump previously mentioned is delivered. There is a pit alongside these two sumps which is equipped with pumps for delivering the acid to the treating tanks.

There is a series of steel tanks with paddle wheels in which a milk of lime solution is made up. Ordinary lime is treated with water and stirred around very rapidly in these tanks until a milk is produced. This is then pumped to the treating tanks containing the waste acid.

Saving Hours of Time

As the neutralizing agent is added a heavy sludge is precipitated, which consists of ferrous

hydroxide and calcium sulphate. As the sludge forms, a Duriron No. 604 Centrifugal Pump operates at each tank, catching the reacting material from the bottom and throwing it over the top of the tank, back into the reacting mixture. These pumps simply serve to speed up the reaction and act in the place of large paddle wheels which would be necessary in order to keep the mass stirred up. This method of churning up the reacting materials accomplishes in twenty minutes what would require many hours with an ordinary paddle wheel arrangement. The truth of this is very easily seen as the precipitate that forms is of such a nature that it would tend to entrain acid and salts and make it very difficult for the neutralizing agent to reach the acid and bring about a complete reaction.

Final Disposal

After the reaction is complete there is nothing left but solids and pure water. This is not very easy to separate as the precipitated iron is very much like a gel and settles very slowly. One plant runs the mixture into a gully around which is heaped up huge mounds of earth. There is a series of very large basins which permit the water to flow from one level to another and leave the sludges behind. This flow is very slow and gradual but after the water has reached the third basin it can overflow the bank into a stream, completely free from all iron and lime. We may add that the catch basins for the final disposal are large enough to take care of this particular plant running at full capacity for about 100 years.

Further Information Gladly Given on Request

THE DURIRON COMPANY, INC.
438 N. Findlay St., Dayton, Ohio

DURIRON

cluding additional equipment, for which appropriation of \$137,000 has been asked.

Standard Oil Co., 241 Pennsylvania Avenue, N. W., Washington, asked bids on general contract for addition to bulk oil storage and distributing plant, and automobile service and garage building.

Bureau of Yards and Docks, Navy Department, Washington, has fund of \$350,000 for extensions and improvements at navy yard, Hampton Road, Va. Asks bids until Jan. 6 for administration building for air station there, three-stories, 128 x 214 ft. Cost about \$200,000; also asking bids until Feb. 3 for engine and aircraft overhaul shop at naval operating base, air station, Pearl Harbor, T. H. (Specification 6376).

Public Improvement Commission, City Hall, Baltimore, has authorized machine shops, automobile repair and other manual training shops in seven-story junior high school in Patterson Park district. Cost over \$750,000. Wyatt & Nolting, Keyser Building, architects; Henry Adams, Calvert Building, mechanical engineer.

◀ CHICAGO ▶

Frost Rubber Co., 565 West Washington Street, Chicago, manufacturer of general rubber products, has purchased four-story factory at 1407-15 Dayton Street, for new plant and will remove later to new location, increasing capacity.

City Council, Grand Junction, Iowa, contemplates erection of municipal electric light and power plant. Special election called Jan. 7 to vote about \$85,000 for project.

Sioux City Gas & Electric Co., 517 Fifth Street, Sioux City, Iowa, plans new turbine house addition at Big Sioux power plant, North Riverside. Cost over \$65,000 with equipment.

Modern Ornamental Iron Co., Chicago, has been organized by Frank and Louis Rosenberg to take over and expand company of same name at 321 North Crawford Avenue.

Board of Water Commissioners, City Hall, Minneapolis, Minn., has asked bids for one-story basement equipment storage and distributing plant, 66 x 116 ft., with repair shop. Cost about \$40,000 with equipment. A. M. Larson, City Hall, is architect.

Clarence Morgan & Co., 355 West Ontario Street, Chicago, manufacturers of industrial chemicals, have leased three floors at 411-23

West Ontario Street, totaling over 40,000 sq. ft., for new plant. Capacity will be increased.

Kuehne Mfg. Co., Flora, Ill., manufacturer of furniture, plans branch plant at Mattoon, Ill. Cost over \$90,000 with equipment, all to be electric-operated.

United States Engineer Office, Duluth, Minn., asks bids until Jan. 4 for direct-connected steam turbine generator set (Circular 30).

Central Broadcasting Co., Des Moines, Iowa, operating Stations WOC and WHO, Des Moines and Davenport, Iowa, respectively, plans new broadcasting station at Marengo, Iowa, with steel towers for antenna, power station and other structures. Cost about \$125,000.

Iowa Soda Products Co., Council Bluffs, Iowa, will rebuild part of plant recently destroyed by fire. Loss over \$100,000 with equipment.

Gabriel Co., East Fortieth Street, Cleveland, manufacturer of snubbers, shock absorbers and other automotive equipment, has purchased plant and business of Kari-Keen Co., Sioux City, Iowa, manufacturer of trunk racks and other automobile luggage carriers, for \$110,000. Sioux City plant will be operated as a subsidiary.

Specialty Tool Corp., Joliet, Ill., recently incorporated to manufacture boring tools, chisels, electric hammers and other equipment, will begin operations in Joliet soon after first of year, according to Elmer J. Huber, president. Company has a factory in Peoria, but will transfer its entire plant to Joliet as soon as location is secured.

◀ INDIANA ▶

Acme-Evans Co., 852 Washington Avenue, Indianapolis, plans rebuilding part of flour mill destroyed by fire Dec. 16. Loss about \$100,000 with equipment.

Indiana State Highway Commission, State House, Indianapolis, J. J. Brown, director, asked bids on general contract for two one-story equipment service and garage buildings at Vincennes and New Albany, each about 50 x 120 ft. Bohn & Mueller, Indiana Trust Building, Indianapolis, architects.

Board of Education, Hammond, contemplates installation of manual training department in three-story and basement Thomas A. Edison grade school, 150 x 225 ft. Cost about

\$325,000. J. T. Hutton & Son, Hammond, architects.

Chesapeake & Ohio Railroad Co., Richmond, Va., has asked bids for one-story engine house with locomotive repair facilities at Peru, Ind., 30 x 190 ft. C. W. Johns, Richmond, is company engineer.

McDougall Co., Frankfort, manufacturer of kitchen cabinets, etc., has been reorganized under same name with capital of \$500,000.

Muncie Foundry & Machine Co., Muncie, has increased operations to four days a week, according to W. C. Sampson, secretary and treasurer. Plant has been running only one and two days a week.

◀ MILWAUKEE ▶

Wisconsin Telephone Co., 722 North Broadway, Milwaukee, has announced a \$7,000,000 budget for 1932 for extensions, improvements and replacements in Milwaukee and elsewhere in Wisconsin. George F. Crowell is chief engineer.

Eastman Mfg. Co., Manitowoc, Wis., manufacturer of hose couplings, will start work early next year on shop extensions costing about \$40,000, largely to accommodate production of new designs recently perfected. Details will be made public shortly.

Hoberg Paper & Fibre Co., Green Bay, Wis., is placing contracts for new 400-ft. dock on Fox River within mill properties for unloading raw materials and loading shipments direct, eliminating present necessity of water-and-rail transfers. Improvement will cost \$50,000.

City of Port Edwards, Wis., has approved bond issue of \$75,000 in addition to loan of \$50,000 from State fund for new senior high school, plans for which are being drawn by Childs & Smith, architects, 720 North Michigan Avenue, Chicago. A. C. Ross is chairman, board of education.

Federal Pressed Steel Co., 714 East Keefe Avenue, Milwaukee, has stepped up production 100 per cent since Nov. 1 to handle orders for automobile bumpers and metal tire covers. Present schedule of 6½ days a week, with two departments maintaining night crews is assured until latter part of January.

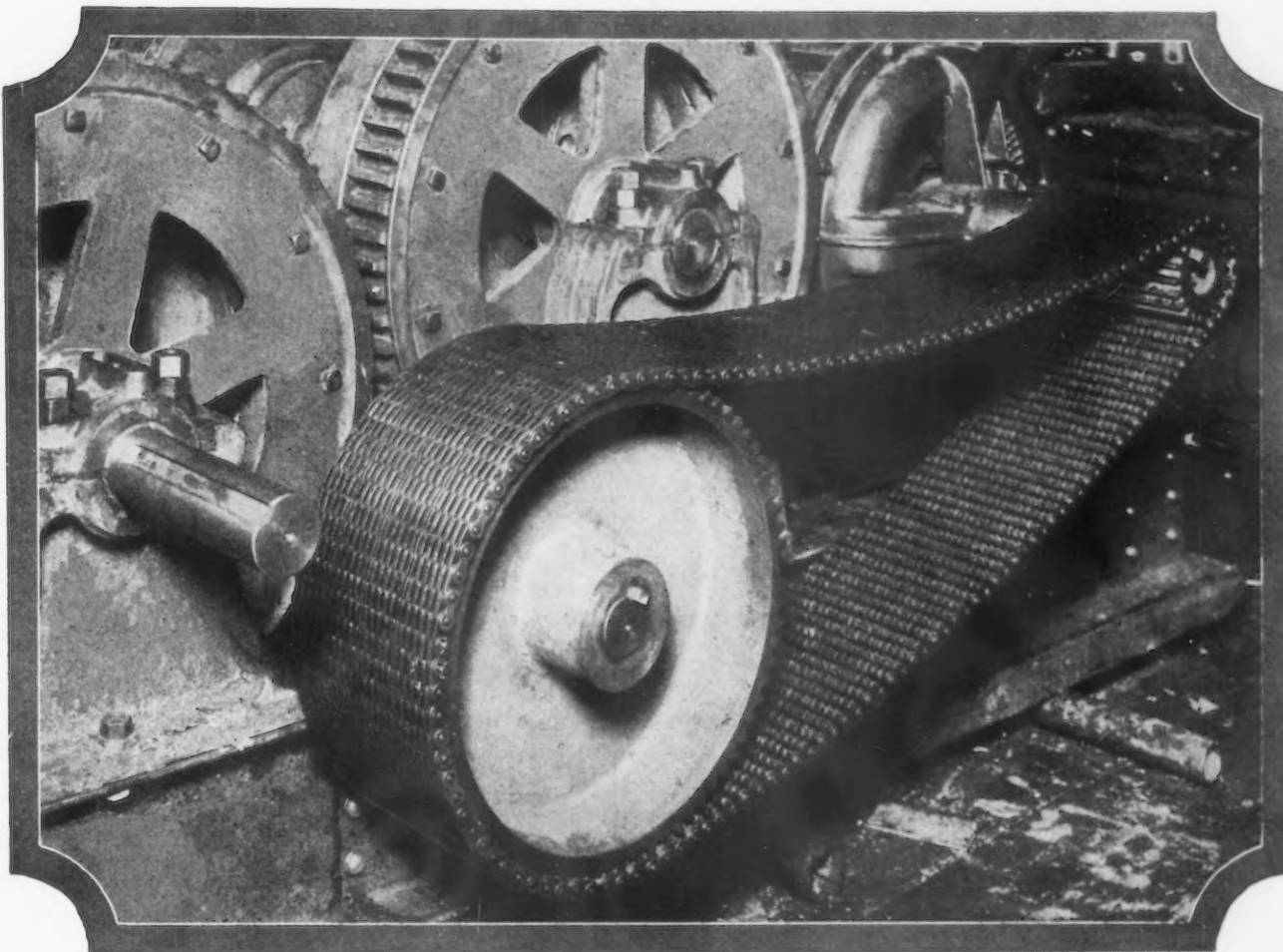
Common Council, Kewaunee, Wis., has authorized bond issue of \$20,000 for improvements in municipal light and power plant. James W. Cain is city clerk.

H. A. Zartner Co., 1912 North Killian



Rustless Steel Tank Car Built for Milk Transport

THE second refrigerated milk car to be built in this country with rustless steel tanks was exhibited by the North American Car Corp. at the recent National Dairy Exposition in Atlantic City. The first was built by the General American Tank Car Corp. and has been in use about a year. The latest rustless steel tank car was built by the Pressed Steel Car Co. at McKees Rocks, Pa., and the tanks were fabricated of Allegheny metal by the Alloy Products Corp., Milwaukee. The car contains two 4000-gal., seamless tanks of welded Allegheny metal plate, polished on the inside. The tanks are covered with a 3-in. insulation, which is inclosed with welded 3/32-in. tank steel. Equipment includes a specially designed outlet valve, angle-stem thermometer, observation glass, electric observation light and sanitary fittings. Each tank is provided with a two-speed, motor-driven agitator.



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PITTSBURGH
Pittsburgh Gear & Machine Co.,
27th & Smallman Streets

PORTLAND, ORE.
Portland Iron Works,
495 Northrup Street

SAN FRANCISCO
A. H. Coates Co.,
615 Howard Street

SEATTLE
Benz-Evans Chain Co.,
1729 First Avenue, So.

SYRACUSE
George McPherson,
201 Norwood Ave.

Place, Milwaukee, manufacturer of and contractor for ornamental iron, structural steel, etc., has moved plant and offices to larger quarters at 3408 North Holton Street, gaining about one-third more capacity.

Metalware Corp., Two Rivers, Wis., manufacturer of electrical and mechanical toys, utensils, etc., has passed from Koonig interests to new ownership represented by Elmer Bleser and Elmer Drumm, both of Two Rivers.

City of Green Bay, Wis., and several contiguous villages have formed East River Metropolitan Sewerage District with view of erecting \$700,000 sewage and disposal system. Work is planned to begin about March 15. E. A. Neufeld, 413 Minahan Building, Green Bay, is chairman of commission.

◀ CLEVELAND ▶

Gledhill Road Machinery Co., Galion, Ohio, manufacturer of road-building machinery, has superstructure under way for one-story plant, 90 x 200 ft. Cost about \$50,000 with machinery.

Libbey-Owens-Ford Glass Co., Nicholas Building, Toledo, Ohio, manufacturer of sheet glass products, has purchased plants and business, including patents of Triplex Safety Glass Co. of North America, Inc., Clifton, N. J., manufacturer of special sheet glass for automobile windshields, etc. Purchasing company will consolidate and will dispose of Clifton plants to Pittsburgh Plate Glass Co., Pittsburgh, which will use for safety glass production under license.

General Air Conditioning Corp., Cleveland, has been organized by Harry German and Bert D. Glick, 212 Engineers' Building, to manufacture air-conditioning equipment.

Hupp Motor Car Corp., Fostoria, Ohio, is making improvements in equipment at local crankshaft works and production of 300 crankshafts daily will be increased. Headquarters are at Detroit.

Quality Parts Co., Cleveland, care of C. E. Walling, 1338 West Twenty-fifth Street, will soon take bids on general contract for one and two-story automobile parts service and repair works, with office facilities, 40 x 150 ft. and 30 x 40 ft.

Wilkes-Overland Co., Toledo, Ohio, is increasing production to 500 automobiles daily on six-day week schedule and adding 2000 men, making total force of 7000.

◀ DETROIT ▶

Flottorp Propeller Corp., Grand Rapids, Mich., manufacturer of airplane propellers, plans new factory, 55 x 67 ft., at Grand Rapids airport. Cost close to \$30,000 with equipment. Other units will be built later.

Kellogg Co., Battle Creek, Mich., plans steam-electric power house for service at mill. Cost about \$70,000 with equipment. Albert Kahn, Marquette Building, Detroit, architect and engineer.

Bieszk Brothers Co., Plymouth, Mich., has been organized by James and Albert G. Bieszk, 37705 Plymouth Road, to operate automotive machine shop for manufacture of parts, repairs, etc.

Detroit Brass & Malleable Works, South Campbell Avenue, Detroit, is making improvements in plant and equipment for increased output. Unit was purchased recently from General Brass Corp. Company has removed general offices from Holden Avenue to new location, which will be developed for main works.

United States Engineer Office, Detroit, asks bids until Jan. 12 for one marine engine (Circular 5).

Saginaw Malleable Iron Division of General Motors Corp., Saginaw, Mich., advanced production and is now running on full six-day week schedule.

Edison Sault Electric Co., Sault Ste. Marie, Mich., subsidiary of American States Public Service Co., Chicago, has begun addition to hydroelectric generating plant on St. Marys River to double capacity. Transmission lines will be built to St. Ignace, Mackinac Island and other points. Cost about \$1,000,000 with equipment.

R. E. Barron Implement Co., Howell, Mich., manufacturer of farm implements, plans rebuilding part of plant recently destroyed by fire. Loss over \$40,000 with equipment.

Keller Tractor & Shovel Co., 5124 Braden Street, Detroit, manufacturer of farm tractors and equipment, has changed its name to Keller Tractor & Equipment Co.

◀ GULF STATES ▶

State Board of Regents, University of Texas, Austin, asks bids until Jan. 29 for group of buildings, including two and four-story engineering unit, cost \$350,000; chemistry and physics building, \$350,000, and other structures. Entire cost about \$1,000,000. Herbert M. Greene, LaRoche & Dahl, Construction Building, Dallas, Tex., architects. Matthews & Kenan, Smith-Young Tower, San Antonio, Tex., consulting engineers for engineering building.

State Highway Department, Austin, Tex., let general contract to Abilene Construction Co., Abilene, Tex., for one-story equipment storage and distributing plant, with repair facilities, 50 x 122 ft., near Dallas, Tex.

United Air Lines, Love Field, Dallas, Tex., has work under way on one-story hangar with reconditioning and repair facilities, about 100 x 275 ft. Cost \$100,000 with equipment.

City Council, Wichita Falls, Tex., is considering erection of a municipal gas plant. Cost over \$85,000 with equipment.

Station WWL, New Orleans, operated by Loyola University, city, will increase power capacity and will install two 200-ft. steel radio towers, dynamos and other electrical equipment. Cost about \$80,000.

Crosbie & Robinson, Tulsa, Okla., operating gasoline refinery at Earlsboro, Okla., plan removal to Kilgore, Tex., with installation of additional equipment for daily capacity of 20,000 gal.

Texas Cabinet & Fixture Mfg. Co., Dallas, Tex., has been organized by E. C. Robertson, 3905 McFarlin Street, and associates, to manufacture cabinets, store fixtures, etc.

Phillips Petroleum Co., Bartlesville, Okla., plans installation of machinery to increase capacity of pumping and power stations for oil pipe line from Borger, Tex., and vicinity.

Jacques de Tarnowsky, 1937 Esplanade Avenue, New Orleans, engineer, plans one-story automobile service, repair and garage building, 75 x 105 ft.

Department of Public Works, City Hall, Dallas, Tex., O. H. Koch, director, plans sewage disposal plant and system, including pumping and power stations, pipe lines, etc. Cost over \$1,500,000. Hawley, Freese & Nichols, Fort Worth, Tex., engineers.

Humble Oil & Refining Co., Houston, Tex., contemplates extensions in storage and distributing plant for oil from John Keating property, Refugio County, Tex., including pipe lines, etc.

Coloidal Phosphate Sales Co., Dunnellon, Fla., contemplates installation of commercial fertilizer mixing plant, with mixing machinery, pulverizing equipment, conveyors, etc.

Goodyear Tire & Rubber Co., Gadsden, Ala., has authorized increased operations beginning Jan. 1, advancing output from 4000 to 5000 tires daily.

◀ PITTSBURGH ▶

State Department of Public Instruction, Harrisburg, Pa., has selected new central school on Newell-Fayette City Highway, near Brownsville, Pa., as experimental school for State for manual training and allied instruction. Jefferson Township School Board, Brownsville, in charge.

United States Engineer Office, Huntington, W. Va., asks bids until Jan. 4 for 20 cast iron vertical rollers and cast iron steel sector bearings (Circular 120).

Smethport Specialty Co., Smethport, Pa., has been organized by W. E. Kerr, West Main Street, and R. W. Kerzok, Smethport, to manufacture toys, metal specialties, etc.

Philadelphia Co., 445 Sixth Avenue, Pittsburgh, affiliated with Standard Gas & Electric Co., New York, is arranging 1932 operating, expansion and improvement program to cost \$10,881,807.

Pittsburgh & Lake Erie Railroad Co., P. & L. E. Terminal Building, Pittsburgh, asks bids until Dec. 29 for quantity of car axles and tubing for first half of 1932 requirements (Contract 1-1932). J. H. James is purchasing agent.

Shaler Township Board of Education, Glenshaw, Pa., plans manual training department and general mechanical shop in three-story and basement high and grade school. Cost over \$200,000. General contract let to Fairchance Lumber Co., Fairchance, Pa. Ingham & Boyd, Empire Building, Pittsburgh, architects.

Oil City Boiler Works, Oil City, Pa., is increasing operations, recalling about 60 men.

Bell Oil Products Co., Beckley, W. Va., recently organized as subsidiary of Pure Oil Co., 35 East Wacker Drive, Chicago, has acquired Bell Oil Products Service Co., with bulk oil storage and distributing plants at Beckley, Hinton and Princeton, W. Va. Expansion is planned.

Westinghouse Air Brake Co., Pittsburgh, is increasing operations with adoption of full time schedule in several departments and additions to working force. Company recently secured order for air brake equipment and couplings for New York subway cars, totaling \$1,750,000.

◀ CINCINNATI ▶

Board of Education, Bexley, Ohio, plans manual training department in new multi-story high school on South Cassingham Road. General contract let to R. H. Evans Co., 395 East Broad Street. Cost over \$300,000.

Contracting Officer, Wright Field, Dayton, Ohio, asks bids until Jan. 11 for three electric scroll saws, five pattern-makers' lathes, five sanders, three wood shapers, four hollow chisel mortisers, four variety saws, two band saws, two surfacers, one cut-off saw, two boring machines, two knife grinders, one sharpener and gummer, four planers and jointers, all motor driven (Circular 242).

Louisville Gas & Electric Co., Louisville, is arranging 1932 operating, expansion and improvement program for power plants and transmission lines. Cost about \$1,381,130. Company is affiliated with Standard Gas & Electric Co., New York.

City Council, Cookeville, Tenn., contemplates erection of municipal electric light and power plant for emergency service. Cost over \$50,000 with equipment.

United States Engineer Office, Memphis, Tenn., asks bids until Dec. 28 for two motor-generator sets, 10 condensers, four transformers, etc. (Circular 439).

Peerless Saw Co., Columbus, Ohio, care of Morris Lopper, 44 East Broad Street, attorney, has been organized by T. J. Stewart and C. F. Callahan, Columbus, to manufacture saws and kindred products.

Department of Public Service, City Hall, Columbus, Ohio, R. S. McPeak, director, plans installation of boilers, pumping machinery, conveying, unloading and other equipment in 50,000,000-gal. sewage disposal plant. Bids asked in about 90 days. Cost over \$3,500,000. R. H. Simpson, City Hall, is city engineer. John H. Gregory, Johns Hopkins University, Baltimore, consulting engineer.

Tennessee Electric Power Co., Chattanooga, Tenn., plans 1932 operating, expansion and improvement program in power plants and system to cost about \$2,000,000.

Ohio Bell Telephone Co., Columbus, Ohio, has authorized expansion and improvements in plants and system in this district during 1932. Cost about \$3,000,000, of which \$2,000,000 will be used for structures and equipment.

◀ ST. LOUIS ▶

F. Bierman & Sons Metal & Rubber Co., 3618 Hall Street, St. Louis, plans two-story addition to storage and distributing plant, 60 x 100 ft.

Marquette Cement Mfg. Co., 140 South Dearborn Street, Chicago, plans extensions and improvements in mills at Cape Girardeau, Mo., and LaSalle, Ill. Cost over \$400,000 with equipment.

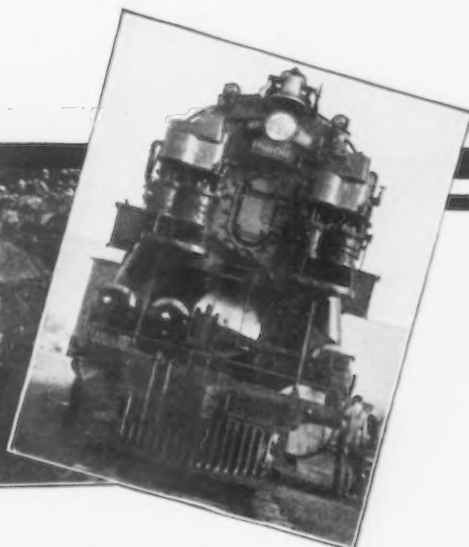
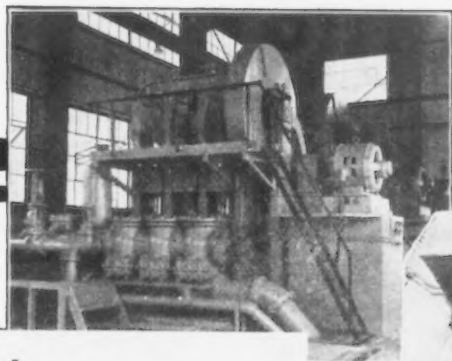
St. Louis Cooperae Co., 101 Arsenal Street, St. Louis, let general contract to Clymonts & Heinicke, Wainwright Building, for two-unit mill, 50 x 130 ft. and 60 x 70 ft., with boiler plant and mechanical departments, at Brinkley, Ark.

City Councils, Bayard, Minatare and Scottsbluff, Neb., plan joint electric light and power plant in North Platte Valley, near Bayard, for service at three communities. Cost over \$80,000 with equipment. Weiland Engineering Co., Thatcher Building, Pueblo, Colo., engineer.

Board of Education, 911 Locust Street, St. Louis, plans establishment of vocational training school for negroes. It is proposed to remodel a school unit.

Lakeside Light & Power Co., operated by Union Electric Light & Power Co., Twelfth and Locust Streets, St. Louis, plans appropriation in 1932 budget of \$200,000 for extensions in transmission and distributing lines in Lake of Ozarks district.

Mid-Kansas Oil & Gas Co., Philtower Building, Tulsa, Okla., contemplates extensions and improvements in oil refinery at Bristow, Okla.



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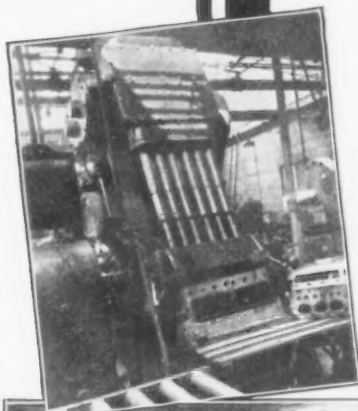
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Business as Others See It

Digest of Current Financial and Economic Opinion

KEY-LOGS to the present impasse, according to New York Times, are a "settlement of the German problem and a halt to the distress unloading of securities in this country. Both must be deemed in a fairer way toward accomplishment, even if inflationary measures are the means."

Harvard Economic Society notes a continuance of the contraction, but "the economic situation is in some respects more wholesome than two months ago. The currency drain has ceased; withdrawals of gold have been followed by imports [one-third of that lost by the raid is back, says the Times]; banking panic has subsided," etc.

But "adequate grounds for forecasting business revival have not yet appeared. The acute stage of monetary crisis may have passed in this country, but it has not yet clearly passed in Europe. If it presently becomes clear that the worst of the crisis is over elsewhere in the world, we may fairly expect the beginning of a cyclical business revival."

Commodity prices have not achieved stability, says *Analyst*, "and with the increasingly critical condition of trade and finance in the rest of the world the prospect

of price stability for our international commodities seems unpromising. . . . Centered upon the crisis in Germany, it is hardly too much to say that the informed world of business and finance hangs in suspense upon whatever settlement may be worked out on the Continent."

"Nationalist sentiment" is blamed by Silberling for the woes of the world. To this is attributed the "great over-issue of securities on the basis of artificially prosperous post-war conditions." The securities created a vast excess in plant, buildings and equipment. And now, with little added capital equipment needed, "the most important source of demand for basic products" is quiescent. Still, "there is a potential use somewhere for all the surplus copper, tin, oil, wheat and cotton," and "over-production of goods could not exist were it not for the freezing up of the channels of trade."

"There is undeniable possibility—though not any certainty—of general inflation in many foreign countries next year," says Brookmire. "If it comes, it is likely to be attended this time with very severe disorders. Currency inflation abroad will not necessarily lead to inflation in the United

States. We do not believe such would be the result, though there would be apprehensions of and agitation for abandonment of the gold standard. The more probable result would be adoption of a stricter policy of isolation."

Two sharply differing viewpoints on "the possible outcome of the present depression" are noted by New York Times. "One holds that, after a little further trouble, all will be much the same as it was before the slump started. The other contends that general retrenchment will be the order of the day. The latter group believes that, during the last inflation period, living standards were artificially raised, and that excessive manufacturing capacity was created which will never be needed and must be reduced. . . .

"It seems fairly certain that, if widespread retrenchment becomes necessary, many of the present evils of the depression would be perpetuated. Cutting the operations of our new industries to the pattern of the demand of ten years ago would undoubtedly aggravate unemployment to a serious, if not impossible, extent. . . . This defeatist view offers little in the way of either cheerfulness or business progress."

Cost over \$100,000 with equipment. Marathon Oil Co., Bristow, plans similar program to cost a like sum.

Oklahoma Gas & Electric Co., Oklahoma City, Okla., plans budget of \$1,573,496 for operation, extensions and improvements in power plants and system in 1932.

Peterson & Almon, Huron Building, Kansas City, Kan., architects, have plans for two-story automobile service, repair and garage building, 50 x 105 ft.

M. S. Bates, Hope, Ark., has secured permission for erection of hangar with repair facilities, oil storage and distributing plant, at municipal airport.

◀ PACIFIC COAST ▶

East Bay Iron & Metal Co., Twenty-fourth and Peralta Streets, Oakland, Cal., let contract to Empire Construction Co., Shell Building, San Francisco, for rebuilding part of plant recently destroyed by fire. Cost over \$30,000 with equipment.

Los Angeles Harbor Department, Los Angeles, will take bids at once for one-story transit building, 120 x 100 ft., with storage and distributing facilities, mechanical-handling equipment, etc., at Los Angeles Harbor. Cost over \$125,000 with equipment.

Bureau of Yards and Docks, Navy Department, Washington, asks bids until Jan. 6 for air compressors for naval operating base, San Diego (Specification 6650).

State Board of Education, Sacramento, asks bids until Jan. 5 for two-story science and mechanical building at San Jose, Cal. Cost close to \$200,000 with equipment. Ralph Wyckoff, Growers' Bank Building, San Jose, is architect; Leland & Haley, 58 Sutter Street, San Francisco, mechanical engineers.

Filice & Perrelli, Gilroy, Cal., let general contract to John Riksheim, Gilroy, for one-story vegetable canning plant, 140 x 265 ft.

Cost over \$100,000 with automatic canning, conveying and other machinery. William Knowles, 1214 Webster Street, Oakland, Cal., architect.

Board of Trustees, Placentia, Cal., has called election Jan. 26 to approve bonds for \$60,000 for extensions in water system, including electric-operated pumping station, elevated steel tank and pipe lines.

California-Oregon Power Co., Medford, Ore., is arranging 1932 operating, construction and improvement budget for power plants and system to cost \$1,097,394. Company is interested in Standard Gas & Electric Co., New York.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 5 for two motor-driven lathes for Puget Sound Navy Yard (Schedule 7100); one grinding machine (Schedule 7111); one universal grinder (Schedule 7122); one double-crane power press (Schedule 7119); all motor driven, for Mare Island Navy Yard.

Kenney Iron Works, 2525 East Forty-ninth Street, Vernon, Los Angeles, has filed plans for one-story shop addition, 25 x 60 ft.

Irvine Valencia Growers' Association, Jeffery Road, Tustin, Cal., let general contract to Jules W. Markel, 2130 Greenleaf Street, Santa Ana, Cal., for one-story and basement addition to fruit packing plant, 110 x 114 ft. Cost over \$50,000 with conveying, loading and other equipment. Clarence Tedford, 2003 North Broadway, Santa Ana, is architect.

Constructing Quartermaster, Fort Mason, San Francisco, asks bids until Dec. 30 for centrifugal pump direct-connected to 75 hp. motor for water system at Presidio.

◀ CANADA ▶

Jenkins Brothers, Ltd., Montreal, has completed first unit of its plant at Lachine, Que., consisting of foundry and power house. Two other units will house machine shop, labora-

tory, research department and executive offices. Total cost is about \$2,000,000.

R. W. Walsh Co., Ltd., Chatham, Ont., has secured a site and will start work soon on a wood-working plant to cost \$50,000, to replace one recently destroyed by fire. Equipment will be purchased.

L. E. Waterman Fountain Pen Co., St. Lambert, Que., is contemplating a plant addition.

Federal Oil & Refineries, Ltd., St. John, N. B., has been incorporated with a capital stock of \$1,500,000. Company proposes to build a refinery at Calgary, Alta., to be ready for operation next March.

◀ FOREIGN ▶

Anglo-Burma Tin Co., Ltd., London, England, operating tin smelting plant near Heinda, Burma, India, plans new smelting works on Hpoontaung Hill, same district, starting project next May. Cost over \$500,000 with machinery.

Central of Brazil Railroad, Rio de Janeiro, Brazil, asks bids until April 30 for electrification of portion of lines, particularly in suburban districts, including branch to Santa Cruz.

Chamber of Commerce, Piedras Negras, Coahuila, C. M. Bres, representative, is head of project to erect 100,000-watt radio broadcasting station, with steel towers, power station, etc. Cost over \$75,000 with equipment.

Associated Telephone & Telegraph Co., 100 West Monroe Street, Chicago, has contract for installation of telephone system in Poland for State-operated system of Polish Government, Warsaw. Cost over \$2,500,000.

Peruvian Steamship Co., Ltd., Callao, Peru, plans dry dock, with plant for construction and repair of vessels up to 10,000 tons rating. Cost over \$200,000 with equipment.

